# MARKET CHAIN ANALYSIS OF HONEY PRODUCTION: IN ATSBI WEMBERTA DISTRICT, EASTERN ZONE OF TIGRAY NATIONAL REGIONAL STATE

**M.Sc. Thesis**

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**Haramaya University**

# MARKET CHAIN ANALYSIS OF HONEY PRODUCTION: IN ATSBI WEMBERTA DISTRICT, EASTERN ZONE OF TIGRAY NATIONAL REGIONAL STATE

**A Thesis Submitted to College of Agriculture**
**Department of Agricultural Economics, School of Graduate Studies**
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**MASTER OF SCIENCE IN AGRICULTURE**
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**By**

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**Haramaya University**

**APPROVAL SHEET**

**SCHOOL OF GRADUATE STUDIES**

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As Thesis research advisors, we here by certify that we have read and evaluated this Thesis prepared, under our guidance, by Assefa Abebe Geza entitled "Market Chain Analysis of Honey Production: In Atsbi Wemberta district, Easter Zone of Tigray National Regional State:" We recommend that it be submitted as fulfilling the thesis requirement.

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## DEDICATION

This piece of work is in memory of my late mother **DESTA BARAKI,** who had played major role in nursing and educating me, and who was eager to see my successes, but who passed away in February 2007 when I was first year graduate student.

## STATEMENT OF THE AUTHOR

First, I declare that this thesis is my solely work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for an advanced M.Sc. degree at the Haramaya University and is deposited at the University Library to be available to borrowers under rules of the library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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## ABBREVIATIONS

| | |
|---|---|
| BLUE | Linear Unbiased Estimator |
| CLR | Classical Linear Regression |
| CC | Contingency Coefficient |
| CSA | Central Statistical Authority |
| DOARD | District Office of agriculture and Rural Development |
| DCSI | Dedebit Credit and Saving Institution |
| EEA | Ethiopian Economic Development |
| EEPD | Ethiopian Export Promotion Development |
| FAO | Food and Agriculture Organization |
| ILRI | International Livestock Research Institute |
| IPMS | Improving Productivity for Market Success Ethiopian Farmers' Project |
| ITC | International Trade Center |
| Kms | Kilometers |
| KB | Koenker Bessett |
| M.a.s.l | meters above sea level |
| MT | Metric Tone |
| NMM | Net Marketing Margin |
| OLS | Ordinary Least Squares |
| RMA | Rapid Market Appraisal |
| TAMPA | Tigray Agricultural Marketing Promotion Agency |
| SCP | Structure Conduct performance |
| SPSS | Statistical Package for Social Sciences |
| TGMM | Total Gross Marketing Margin |
| VIF | Variance Inflation Factor |

# BIOGRAPHICAL SKETCH

The author was born in May 14, 1973 in a Village called Tsehafti near Maichew town, Southern Zone of Tigray National Regional State. He attended his elementary school at Maichew Primary and Junior Secondary Schools and his Secondary school at Maichew Senior Secondary School (currently renamed as Zelealm Desta Junior Secondary School and Tilahun Yigzaw Senior and Preparatory School respectively). Joined Mekelle DonBosco Technical College in September 1992 completed his Diploma in Machine Technology in June 1995. Then after, he was employed in Adigrat Addis Pharmaceutical Factory in September 1997 as Junior Machinist from September 1997-August1999. The author joined Ethiopian Civil Service College in September 1999 and Graduated with B.A Degree in Economics in August 2002.Working latest seven years for Tigray National Regional State Bureau of Agriculture and Rural Development in Cooperative sub-Sector as Monitoring and Evaluation Expert, he joined Haramaya University in July 2006 to perceive his M.Sc. degree in Agricultural Economics.

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## ABSTRACT

*This study was initiated to analyze honey marketing chains particularly in Atsbi Wemberta District, Eastern Zone of Tigray Region. The focus of the study was, to analyze the structure of production costs and determine profitability of the production, to analyze the determinants of honey supply in the study area, identify the major constraints and supply of the commodity to the market, to evaluate structure-conduct-performance of honey marketing. The data were generated by individual interview and group discussions using pre-tested semi structured questionnaires and checklists. This was supplemented by secondary data collected from different published and unpublished sources. Robust OLS regression econometric model was used to analyze the determinants of honey marketable supply. The results obtained from this analysis indicates that education level of the household head, price of honey in 1999 E.C. and the quantity of honey produced were found to be the most important positively significant variables influencing honey marketable supply of the District. The channel analysis of the commodity indicated a very short route. The main market participants for honey marketing of the District during the survey period were honey collectors, retailers and processors. Besides, a significant amount of honey produced is channeled directly to consumers from producers (434%). The honey marketing performance was also measured using marketing margins complemented with analysis of costs and gross profits generated by different marketing channel actors. Major problems of the production identified and prioritized by beekeepers in the study area were drought, pests and diseases of honey bee, lack of beekeeping equipments, death of colony, marketing problems, and shortage of bee forage and lack of adequate beekeeping skill. Based on the study results, interventions demanded to raise marketable supply of honey produced are recommended.*

# 1. INTRODUCTION

## 1.1. Background of the Study

Africa is blessed with numerous types of wild honeybee (Adjare, 1990). Ethiopia is one of the countries of the continent which own big honey production potential. Owing to its varied ecological and climatic conditions, Ethiopia is home to some of the most diverse flora and fauna in Africa. Its forests and woodlands contain diverse plant species that provide surplus nectar and pollen to foraging bees (Girma, 1998). Beekeeping is one of the oldest farming practices in the country. There is an ancient tradition for beekeeping in Ethiopia which stretches back into the millennia of the country's early history (Girma, 1998). Of all countries in the world probably no country has a longer tradition of beekeeping than Ethiopia (Hartmann, 2004). It has been practiced traditionally. Moreover, beekeeping is an appropriate and well-accepted farming technology and it is best suited to extensive range of ecosystems of tropical Africa. To date, over 10 million of bee colonies are existing, which include both feral, and hived ones (Ayalew, 2001).

Ethiopia is the largest honey producer in Africa and $10^{th}$ largest honey producer all over the world. Also considerable amount of wax is produced in the country. On a world level, Ethiopia is fourth in beeswax and tenth in honey production (Girma, 1998). Ethiopia, having the highest number of bee colonies and surplus honey sources of flora, is the leading producer of honey and beeswax in Africa. Ethiopia produces around 23.6% and 2.1% of the total Africa and World's honey, respectively.

The total honey production of Ethiopia is estimated up to 24000 metric tones; only a small amount of this is marketed. Besides poor marketing conditions the main reason is that about 80% of the total Ethiopian honey production goes in to the local Tej-preparation, a honey wine, which consumed as national drink in large quantities (Hartmann, 2004).

However, the products obtained from this sub sector are still low as compared to the potential of the country. Although thousands of tones of honey are produced every year it is usually poorly managed and unattractive in appearance. Because of this its place in the local market being taken by imported honey. Moreover, traditional hive honey is of good quality as long as it is in the hive. Faulty handling, from the time of its harvest until it reaches to market is responsible for its inferior quality. The type of hives used the methods of removing and storage of honey play a vital role in the quality of honey (Crane 1970, as cited by Edessa, 2005).

Ethiopia's wide climatic and edaphic variability have endowed this country with diverse and unique flowering plants, thus making it highly suitable for sustaining a large number of bee colonies and the long established practice of beekeeping. Nevertheless, the bees and the plants they depend on, like all renewable natural resources, are constantly under threat from lack of knowledge and appreciation of these endowments (Girma, 1998).

The principal resource base for beekeeping has, however, become seriously degraded in the course of time. The potential of the Ethiopian landscape for honey and wax production does now, certainly only constitutes a small fraction of its former wealth. Moreover, the destruction of the remaining resource-base can be observed going on at a steadily accelerating pace (Girma, 1998).

Based on this facts even though Tigray region, particularly Atsbi Wemberta District is believed to have diversified types of vegetation and cultivated crops and expected to be potential for beekeeping activities so far there is no compiled and reliable information on honey production and marketing system in the area. The numbers of beekeepers, bee colonies, amount of honey, type of beekeeping practiced and marketing constraints were not known. The District has 18,567 bee colonies (Atsbi Wemberta ARDO, 2008). The entire honey production in the District is mainly for marketing and about 80-90% of the honey produced is sold by rich, middle income and poor households (IPMS, 2005). Despite the high honey production in the study area, there is no ready market attracting beekeepers. Therefore this

study was conducted to collect information on potential and constraints of honey production systems of Atsbi Wemberta district in the Northern part of Ethiopia.

### 1.2. Statement of the Problem

Recognition of critical role of markets in economic development led to comprehensive market reforms across a number of developing countries. In spite of these reforms, symptoms of poorly functioning markets in much of Sub – Saharan Africa are evident in the segmentation of markets, low investment in the market infrastructure, the persistence of high margins and of the market thinness and the limited progression toward more complex arrangements (Eleni, 2001)

The major constraint to increasing the welfare of smallholders is their inability to access markets. Enhancing the ability of poor smallholder farmers to reach markets and actively engage in them is one of the most pressing development challenges. Remoteness results in reduced farm-gate prices, returns to labour and capital, and increased input and transaction costs. This, in turn, reduces incentives to participate in economic transactions and results in subsistence rather than market-oriented production systems. Sparsely populated rural areas, and high transport costs are physical barriers to accessing markets; lack of negotiating skills, lack of collective organizations and lack of market information are other impediments to market access (Jones, 1972).

An efficient, integrated, and responsive market mechanism, which is, marketed with good performance, is of crucial importance for optimum allocation of resources in agriculture and for stimulating farmers to increase output (Jones, 1972; FAO, 1999; Acharya and Agarwal, 1999). Without having convenient marketing conditions, the possible increment in output, rural incomes and foreign exchange resulting from the introduction of improved production technologies could not be effective. An improvement in marketing efficiency, thus, attracts the attention of many countries and viewed as an important national development strategy.

Honey production in Atsbi Wemberta district is mainly with seasonality where surplus at harvest products is the main characteristics. The nature of the product on the one hand and the lack of organized market system on the other often resulted in low producers' price. No studies have been carried out to identify what the marketing systems look like and no remedial measures were taken so far. This, therefore, demanded a holistic study of the system in the form of market chain analysis.

Market chain analysis is supposed to be the current approach working in studies of such type of production and marketing problems. Analysis of the system in terms of honey market structure, conduct and performance taking in to consideration the product and location specificity will, therefore, be used to identify the bottlenecks and come up with precise possible solution. Even though both honey and honey by-products are economical and socially important, no adequate study has been made in the study area to improve the sector. This study therefore, has attempted to contribute to filling the information gap by investigating the honey marketing chains and factors affecting honey supply in Atsbi Wemberta District.

### 1.3. Objectives of the study

The over all objective of this study was to analyze honey market chains in Atsbi Wemberta District. The specific objectives were to (1) analyze the structure of production costs and determine profitability of production (2) analyze the determinants of honey supply in the study area (3) analyze the market structure, conduct and performance of honey market (4) identify the major constraints, opportunities of production and supply of the commodity to the market

### 1.4. Scope of the study

The area coverage of this study was limited to Atsbi Wemberta District. And it also was focused on the functioning of the market and relationship among the actors within the

marketing chains, transportation, marketing information, finance, institutions involved in honey marketing and factors affecting supply of honey production in the study area. Different market levels, role of actors in the channel, and bargaining characteristics of producers, buying and selling strategies, and trades' behaviors in the whole marketing process were seen.

### 1.5. Significance of the Study

This study would generate useful information in order to formulate honey marketing development projects and guidelines for interventions that would improve the efficiency of honey marketing system. The potential users of this finding would be farmers (producers), traders, government and non-government organizations, that have an interest to intervene in honey marketing system. Researchers who want further investigation on honey marketing would use the result from this study.

### 1.6. Limitations of the study

The main limitation of this study was mainly related to coverage of the study area. There are a number of known Districts in honey production in the region. However, the study focused only in Atsbi Wemberta District due to budgetary and time limitations. The other limitation of the study was that, this study being the first in the District lack many detail investigations.

### 1.7. Organization of the study

The first chapter deals with the background, statement of the problem, objectives and significance of the study. The second chapter consists of the review of the literature. Methodology is outlined and described in the third chapter. The fourth chapter deals with the results and discussions. Conclusion and recommendations are presented in the fifth chapter.

# 2. LITERATURE REVIEW

The aim of this chapter is to discuss concepts such as market, marketing, marketable supply, market chain, market structure, conduct and performance. In relation to these issues, the chapter highlights about the production and marketing of honey in the World, Africa and Ethiopia.

## 2.1. Basic Concepts and Definitions

Marketing is an institution or mechanism which brings together buyers ("demanders") and sellers ("suppliers") of particular goods and services. As a basic definition, marketing is the process of satisfying human needs by bringing products to people in the proper form and at the proper time and place. Marketing has an economic value because it gives form, time, and place utility to products and services. As products definition it is the performance of all the transactions and services associated with the flow of good from the point of initial production to the final consumer. As business firm marketing is as a complete management concept through which the company sells itself as well as its line of product. And from the view point of society, it is defined as all the process necessary to determine consumers' physical and societal needs and to conceptualize and affect their fulfillment (Barson and Norvell, 1983).

The term market has got a variety of meanings. In some cases the market may mean the place where buying and selling takes place, an area in which a good is sold, a group of people carrying on buying or selling, or the commodity traded, such as the corn market, or time market (Larson, 1957).

Marketing involves all activities involved in the production, flow of goods and services from point of production to consumers. Marketing includes all activities of exchange conducted by producers and middlemen in exchange for the purpose of satisfying consumer demand. It is defined as the set of human activities directed at facilitating and consummating exchange. All business activities facilitating the exchange are included in marketing (Kotler, 2003).

Marketing has an intrinsic productive value, in that it adds time, form, place and possession utilities to products and commodities. Through the technical functions of storage, processing and transportation, and through exchange, marketing increases consumer satisfaction from any given quantity of output (Mendoza, 1995).

As expressed by FAO (1997) food and agricultural marketing not only means the movement of agricultural produce from the farm (where it is produced) to the consumer or manufacturer but also includes the marketing of production supplies to farmers like fertilizer, pesticide, chemicals, machinery, animal feed, tools and equipments.

Market chain is the term used to describe the various links that connect all the actors and transactions involved in the movement of agricultural goods from the producer to the consumer (CIAT, 2004). Commodity chain is the chain that connects smallholder farmers to technologies that they need on one side of the chain and to the product markets of the commodity on the other side (Mazula, 2006).

### 2.2. Marketing Channels

Formally, marketing channel is a business structure of interdependent organizations that reach from the point of product origin to the consumer with the purpose of moving products to their final consumer destination (koler *et al.,* 2003). The analysis of marketing channels is intended to provide a systematic knowledge of the flow of goods and services from their origin (producer) to their final destination (consumer). This knowledge is acquired by studying the "participants" in the process those who perform physical marketing functions in order to obtain economic benefits. In carrying out the functions, marketing agents achieve both personal and social goals. They add value to production and in so doing help satisfy consumer needs. This price also serves as a signal to all the actors in the marketing channel, i.e. producers, rural assemblers, transporters, wholesalers, and retailers (Mendoza, *et al.,* 1982).

## 2.3. Marketing Agents

**Producer:** It is first link in the marketing chain analysis of agricultural products. The producer harvests the products and supply to the second agent. From the movement he/she decides what to produce, how to produce, how much to produce, when to produce, and where to sale.

**Rural assembler:** Some times also called transporter or the trader; he/she is the first link between producer and other middlemen.

**Marketing boards: It** is a legalized single government agency charged with the responsibility of a nation's total output of a particular commodity.

**Wholesaler:** He provides the optimum combination of functions and services for different kinds of retailers, and performs desired distribution functions for different kinds of processors. Carry a wide range of products that meet almost all the retailers' requirements and his emphasis is on a complete line of products and several major brands.

**Agents and brokers:** They handle individual brands and sell to food chains, general wholesalers, and institutional markets on a commission or fee basis. Agents and brokers do not take title to or warehouse the products they sell. They operate under a franchise or contract agreement. Their duty is to provide a major sales effort for the brands they represent.

**Retailers:** Middlemen, which includes supper markets and other large scale retailer who divides up large scale shipments of produce and sell it to consumers in small units. The basic function they provide is bulk breaking.

**Consumer:** The last link in the marketing chain. The participants and their respective functions often overlap. The widest spread combinations are: traders- wholesalers that collect the commodity and supply it to retailers, wholesalers-retailers (wholesalers that also sell directly to consumers and wholesalers- exporters).

## 2.4. Marketable and Marketed Surplus

Marketable surplus is the quantity of the produce left out after meeting the farmer's consumption and utilization requirements for kind payment and other obligations such as gifts, donations, charity, etc. Thus, marketable surplus shows the quantity left out for sale in the market. The marketed surplus shows the quantity actually sold after accounting for losses and retention by the farmers, if any and adding the previous stock left out for sale (Thakur *et al.,* 1997). Thus, marketed surplus may be equal to marketable surplus, it may be less if the entire marketable surplus is not sold out and the farmers retain some stock and if losses are incurred at the farm or during transit. The importance of marketed and marketable surplus has greatly increased owning to the recent changes in agricultural technology as well as social patterns. In order to maintain the balance between demand for and supply of food grains with the rapid increases in demand due to higher growth population, urbanization, industrialization and over all economic development accurate knowledge on marketed and marketable surplus is essential in the process of proper planning for the procurement, distribution, export and import of agricultural product (Malik *et al*., 1993).

## 2.5. Market Structure, Conduct and Performance Analysis (S-C-P)

Since the 1960s, the systematic nature of markets has increasingly been emphasized in defining means of analyzing their efficiency. The S-C-P approach or industrial organization school is then developed. The approach has been used in the study of markets in many countries such as in India by Level and Harris and in West Africa by Jones among others (Magrath, 1992). The S-C-P approach focuses on the behavior of groups rather than individual firms, and looks into the influence of the horizontal relationships among these firms on market performance. Thus, it is suggested that the S-C-P model is preferable to that model which analyze the productive efficiency of individual marketing enterprises (Magrath, 1992).

The most commonly used theoretical frame work (model) is the structure-conduct-performance model. Social, political, economic and physical environment in different societies influence the operation of the marketing system (Kohls and Uhl, 1985). The interrelationship between the factors and their influence on firms' behavior within the society will change through time. The implicit goal of public policy has been to protect and promote setting that approaches the conditions of pure competition. Consistent performance model (S-C-P), which appears to provide significant part of the theoretical support for the policy formulation (Kohls and Uhl, 1985; Abbot; 1958).

### 2.5.1. Market structure

Market structure shows trends in the number and size of firms relative each other and to the number of consumers and producers in particular time and place (Malhotra, 1996). It explains about Presence /absence, the levels and nature of entry barriers distribution of market information and its adequacy in sharpness of prices and quantity compositions and individual risk (Kohls and Uhl, 1985; abbot; 1958). Conduct explains price policy, advertising policy, output policy, legal tactics, etc (Abbot, 1958). Performances depend on conduct of sellers and buyers which intern is strongly influenced by structure of the relevant market. It also shows a locative efficiency, technical efficiency, equality, innovation etc. (Purcel, 1979).

A commonly used measure of the performance of a marketing system is the marketing margin or price spread (Abbot *et al*., 1990). Margin or spread can be useful descriptive statistics it used to show how the consumer's expenditure is divided among participants at different levels of the marketing system. Abbot *et al*., (1990) defined marketing margin as the difference between price consumers pay and product and then resell it together with specific charges for marketing services rendered. The relative share of the different market participants will be estimated using the marketing margin analysis. The total marketing margin in marketing system constitutes the marketing costs plus the profit earned. The price that is obtained by producers, or as the price of collection of marketing services, which the outcome of the demand for and supply of such services. Marketing services include such items as assembling,

grading, storing, processing, packing, distribution, and transportation (Branso and Norvell, 1983). It is made of individual margins obtained by intermediaries who actually assume ownership of product and then resell it together with specific changes for marketing services rendered. The relative share of the different market participants will be estimated using the marketing margin analysis. The total marketing margin in marketing system constitutes the marketing costs plus the profit earned.

### 2.5.2. Market conduct

Marketing conduct refers to the patterns of behavior that enterprises follow in adopting or adjusting to the markets in which they sell or buy (Bain, 1968). Such a definition shows the analysis of human behavioral patterns that are not readily identifiable, obtainable, or quantifiable. Thus, in the absence of theoretical frame work for market analysis, there is a tendency to treat conduct variables in descriptive manner. The specified structure features of homogeneous product, and free entry and exit require a form of conduct such that each firm must operate as if in isolation. Market conduct is exceedingly complex, encompassing as it does virtually all human decision masking within business organizations and, by extension, household, on top of the market structure, the legal environment and the internal organization of the business enterprise influence the market conduct (Wolday, 1994).

Bain (1968) names two closely interrelated aspects of market conduct: the manner in which, the devices and mechanisms by which, the different sellers coordinate their decision and action, to each other, or succeed in marketing them mutually consistent as they react to demand for their products in a common market, and the character of pricing policies and related market policies that the sellers in the industry adopt; assessed in terms of individual or collective aims or goals that they pursue as they determine their selling prices, their sales promotion outlays, the designs and qualities of their products and so forth. By examining the relationship between the factors of the market structure and their setting practice; it may be

possible to make some predictions about the consequences of these behavioral patters for performance.

### 2.5.3. Market performance

Market performance according to Bain refers to the composite of results that firms in the market arrive at by pursuing whatever line of conduct they espouse-end results in the dimensions of price, output, production and selling cost, product design, and so forth (Wolday, 1994). For firms acting as sellers, these results measure the character of the firm's adjustment to the effective demands for their outputs; for firms buying goods, they measure the quantity of adjustments made by firms to the supply conditions of the goods, they purchase. There are two main indicators of market performance: Net return and marketing Margin.

Estimation of net returns and market margins provide indications of an exploitative nature when returns of buyers are much higher than the fair amount, that is including all marketing costs and return to management and risk, and when market margins increase not because of higher real marketing costs but because prices paid to producers are lower. The analysis of market performance using the industrial organization framework is as follows: Collusive pricing (market conduct) becomes possible if (i) market concentration is high (market structure); (ii) entry barriers are high (market structure); and (iii) market information is not available to all participants (market conduct).

This results in net returns and marketing margins that are much higher than the "fair" amount (Pomery, 1989). Market performance refers to the impact of structure and conduct as measured in terms of variables such prices, costs, and volume of output (Bressler and King, 1970). By analyzing the level of marketing margins and their cost components, it is possible to evaluate the impact of the structure and conduct characteristics on market performance (Bain, 1968). For most countries, it is generally acknowledged that a distribution system

displaying acceptable performance is one that allows technological progress, has the ability to adopt, innovate, and utilize resources efficiently and to transmit prices that reflect costs (OECD, 1982). Prices are thus viewed as a stimulus for an efficient allocation of resources. Hence, desirable market performance is directly related to the competitiveness of an industry because distortions thereof tend to impede price efficiently.

### 2.6. Market Concentration

Market concentration refers to the number and size of distribution of buyers and sellers in a market. The greater the degree of concentration, the higher the possibility of non competitive character, such as collusion, existing in the market. It is generally believed that higher market concentration indicates non-competitive behavior and thus inefficiency. Devine *et.al*. (1984) "buyer concentration is analogous to seller concentration, and in principle a range of absolute and relative measure of buyer concentration corresponding to those seller concentration could be Constructed. However, such measures have not been constructed, to the absence of product by purchasing firms." The relationship between concentration and market behavior, and performance must not, be interpreted in isolation. Other factors such as the firms' objectives, barriers to entry and exit, economics of scale, and assumptions about rival firms behavior, will all relevant in determining the degree of concentration and the relationship between concentration and behavior and performance (Scherer, 1980).

There are a number of measures of market concentration and the most commonly used is the market index, which measures the percent of traded volume accounted for by a given number of participants. Empirical studies in the field of industrial organization suggested certain level of at which non- competitive behavior of market participant begins in different industries. For example, Kohls and Uhl (1985) suggests that a four firms concentration ratio (CR4 ), that is, the market share of the larger four firms, of less than or equal to 33% is generally indicator of a competitive market structure, while a concentration ratio of 33% to 50% and above 50% may indicate a weak and strongly oligopolistic market structure, respectively. However, the concentration ratio of four firms is best regarded as a "rule of thumb," and there are reasons

why high concentration levels may be reasonable in light of small potential volumes of trade (Gebremeskel *et al.,* 1998).

### 2.7. Supply and Supply Chains

"A supply chain is a network of organizations that are involved through upstream and downstream linkages in different process and activities that produce value in the form of products and services in the hands of the ultimate user" (Christoher, 1998 in: Omta *et al.,* 2001: 78) An important aspect of supply chain is that they consist of some associated, but distinct flows. The physical flow of the commodity and the flow of money realized from final sale back to the producer and all the firms that have been involved in processing and marketing. The efficiency and effectiveness of a practices and procedures that govern this latter flow are as important as technical efficiency with which the commodity is produced, processed and marketed (Westlake, 2005).

Supply is predominantly determined by price of the commodity in question especially when there are floor and cutting prices imposed by the government or any other responsible body. If the government imposes a maximum, or ceiling prices on a good, the effect is to cause a shortage that good and frequently creates a black market (underground market) that rations that quantity available.

#### 2.7.1. Supply determinants

The most important factors which determine market supply could be divided into economic factors which include product price, provision of consumer goods, production cost and market supply costs and political factors which include the level of government intervention (Maro, 1996; cited in Wolday, 1994). One of the expected important variables which influence the behavior of the market supply of producers is price. If price increases, producers will gain high revenue and would be motivated to increase the market supply (Wolday, 1994).

As Branson and Norvell (1983) stated the model as general statement of a supply functional relationship that includes the major factors that affecting the supply offer farmers is a function of (a) price of the commodity to be supplied (b) cost of all the inputs necessary to produce the commodity (c)net income or profit that could be had from alternative crops ( d)state of technology that affects potential yields ( e)total acreage available ( f) expectations about future price changes (g) risks to production (weather, insects)Three of the factors warrant special comment: technology, expectation, and risks. All three have to do with shifts in the supply curve. Technology is perhaps the major factors influencing supply, which includes the development of new varieties of plants that give higher yields. It breakthroughs cause a shift of the supply curve to the right. Expectations about future price changes also have a strong influence on agricultural production. Most econometric tests of supply response behavior find that farmers' expectations about prices are influenced greatly by the present price and to a lesser degree by that of the previous year. Risk is also significant in shifting the supply curve. For high- risk crops, prices are necessary to call forth a given level of production. Prices also show increased variability because production plans are not always achieved.

### 2.8. Honey production and Marketing

World production of honey during the 1990s was in excess of 1.2 million metric tones (MT) per year. Beeswax production was more than 50,000 MT per year. World demand for these products is substantially in excess of these amounts and is likely to increase even further. FAO, 2005 data indicated that world trade in honey during the 1990s amounted to more than 300,000 MT per annum with Western Europe and the United States in particular being major importers at an average price of about US $1500 per MT. World trade in beeswax amounted to about 10,000 MT per annum with Western Europe accounted for about one half of total imports with the world price average about US $ 4000 per MT.

In 2004 estimated world production of honey was higher than the medium term average at 1.38 million MT. Beeswax productions was also higher at 60,153 MT (FAO, 2005) In comparison to these amounts, production in sub Saharan Africa (Africa South of the Sahara

but excluding the Republic of South Africa) was 135,375 MT of honey and 14,165 MT of beeswax, most of which came from a very few countries (Table 1).

Much of African honey production is gathered rather than framed, private sector modern production with many movable frame hives and inputs such as winter or out of season feeding and use of disease prevention measures is largely unknown in sub Saharan Africa. The use of hives with removable top bars has been promoted intermit and often in a not very coordinated way in some countries by government extension services (Fadare, 2003). Almost all African honey and beeswax is traditionally which is almost synonymous with inefficiently. The problem with all these traditional hives is that they engender low output; in Ethiopia, for example, there were an estimated 4.55 million hives in 2005 (CSA, 2006) which, based on FAO, 2005 data for National production, is equivalent to 8.85kg honey and 0.95 kg wax per hive per year, although better beekeepers using long hives can achieve 15 kg per hive per year in more favorable areas. In addition to low yield traditional hives often have to be destroyed in the process of extraction.

Table 1. Production of honey and beeswax (metric tones) in Africa and selected African Countries in 2005

| Country | Honey | Beeswax |
|---|---|---|
| Angola | 23,000 | 2,000 |
| Burundi | 240 | 45 |
| Cameroon | 3,000 | 287 |
| Central A.R | 13,000 | 690 |
| Chad | 960 | 0 |
| Ethiopia | 39,000 | 4,300 |
| Guinea | 600 | 0 |
| Guinea-Bissau | 65 | 100 |
| Kenya | 21,000 | 2,400 |
| Madagascar | | 390 |

Source: FAOstaticallydata,2005

Africa production represents only 9.8% of the World production of honey and 23.5% of beeswax. Exports of honey from sub Saharan Africa countries in 2004 were 184 metric tones valued at US$ 469,000 whereas in the same year there were imports of 874MT valued at US$ 2,708,000. Exports of beeswax from sub Sahara Africa in 2004 were 721MT valued at US$ 465,000 but in the same year there imports of 255 MT valued at US$ 224,000 (FAO, 2005). These amounts of exports and imports are minimal in World trade figures. They show, however, that African honey is sold on the World market at a price of US$ 2,549 per MT whereas imports are valued at US$ 3,098 per MT and beeswax is sold at US$ 645 per MT and bought at US$ 878 per MT. There thus seem to be considerable opportunities not only for increasing the quantity of African's major hive products but also for improving their quality.

Total estimated honey production for Ethiopia as indicated by the International Trade Center (ITC) 1986, ranges from 19,400-21,000 tones per annum between1976-1983. This contributed 23.28% to the total Africa honey production and 2.03% to the total world production in 1976. This went up to 23.58% and 2.13% for the total Africa and world honey production, respectively in the year 1983.

Furthermore, there has been an increased production of honey over the period 1984-1994, i.e., from 21.480 tones in 1984 to 23, 700 tones in 1994 (Hartman, 2004).The current honey production is estimated at 24,600 tones per year. The estimated is based on a 65% and 75% occupational efficiency of 7.5 million traditional hives and 20 thousand framed hives respectively.

Honey is almost exclusively used (80%) for local consumption, to a very large extent for the brewing of mead, also called "Tej" (local beverage). Even though honey satisfies local demand it is so crude that it will not compete in the international market. However, an average of 3.05 tones per annum has been exported to neighboring countries over the years 1984-1994 (ITC, 1996). As indicated in Table 2, on average between 1998 and 2003, 307.22 tones of honey worth 88,679 Birr has been exported yearly.

Table 2. Export of honey 1998 – 2003

| Year | Honey (in tones) | Value (in Birr) |
|---|---|---|
| 1998 | 1781.10 | 78,188 |
| 1999 | 100.80 | 29,245 |
| 2000 | 761.20 | 221,363 |
| 2001 | 129.00 | 30,922 |
| 2002 | 333.90 | 93,269 |
| 2003 | 340.30 | 79,087 |
| Total | 1843.30 | 532,074 |
| Average | 307.22 | 88,679 |

Source: Ministry of Trade and Industry, Annual External Trade Statistics; 1999-2003

Another valuable hive product obtained from honeybees is beeswax. It is largely collected from traditional hives rather than the moveable frame hives. The wax yield from traditional hives is 8-10 percent of the honey yield, compared to 0.5-2 percent from frame hives. The annual production of wax is estimated at 3,200 tones. This estimated is without considering much of the beeswax produced in remote areas where it is usually wasted. Thus, after China, Mexico and Turkey, Ethiopia is the fourth largest wax producing country with an estimated 3, 000 tones per annum.

With regarding export of beeswax, Ethiopia is one of the biggest wax exporters to the world market. An average of 270 tones was exported per year over the period 1984-1994 which in turn generated over ETH Birr 2 million per annum to the national economy. Currently, the annual turn-over of the apicultural industry varies between 185 and 450 million ETH Birr, of which only 5 million Birr worth beeswax exported (EEPD, 2006). As indicated in Table 3, the on average between 1998 and 2003, 37,477.616 tones of beeswax worth 7,321,680.10 Birr the country has been exported yearly.

Table 3. Export of beeswax 1998-2003

| Year | Wax (tones) | Value (in birr) |
|---|---|---|
| 1998 | 84183.9 | 10513987 |
| 1999 | 34969.3 | 9914049 |
| 2000 | 21692.4 | 5549274 |
| 2001 | 31095.1 | 7247268 |
| 2002 | 28498.3 | 6005768 |
| 2003 | 24426.7 | 4699735 |
| Total | 224,865.7 | 43930081 |
| Average | 37,477.616 | 7321680.16 |

Source: Ministry of Trade and Industry, Annual External Trade Statistics; 1999-2003

Although the annual production of both honey and wax is large compared to other African countries, the system of production commonly exercised in the country is traditional. Productivity of honey bees is very low and only on average of 5-6 Kg of honey could be cropped per hive per year. However, in areas where improved technology has been introduced, an average of 15-20 Kg per hive per year has been recorded. The major constraints that affect apiculture in Ethiopia are lack of beekeeping knowledge, shortage of trained manpower, shortage of beekeeping equipments, pests and predators and inadequate research works to support development programs.

# 3. RESEARCH METHODOLOGY

The study was conducted in Atsbi Wemberta district, one of the pilot Learning Sites of Improving Productivity and Market Success (IPMS). In this study area, honey has been identified as one of the major important marketable commodities. Honey production is increasing in the study area due to the introduction of modern beehives and bee forages because of area closure.

## 3.1. Description of the Study Area

Atsbi Wemberta district is located about 65km North East of the regional State capital, Mekelle. There are sixteen Peasant Associations (PAs) and two dwellers associations in the district with a total of 41,398 household heads (IPMS, 2005). According to the information from district Agricultural and Rural Development Office (2008), the total population of the district was 112, 639 of which 55,359 (49.15%) are males and 57,280 (50.85%) are females. Urban and rural population is 9,609 and 103,030 respectively. Altitude in the area ranges from 918 to 3069 m and 75% of the district is upper highlands (2600 masl or above) and only 25% is midlands (between1500 and 2600masl). The district has a total area of about 1223 sq km. The areas of the sixteen PAs ranges from 26.5 sq.km to 209 sq.km. Generally the district has 70% and 30% Dega and Weina Dega weather condition, respectively. The current land use pattern includes 89,185ha forest and bush land, 13,059.45ha cultivated land, 8,742ha grazing land and the rest for others (ARDO, 2008).

Atsbi Womberta is one among the districts in the region that border the Afar regional state shortage of rainfall is a major constraint of agricultural production in the district. Rainfall is usually intense and short duration. The annual rainfall is between 500mm to 624mm. Hence it is one of the drought prone districts in the region. The area receives bimodal rainfall belg (short rains) from November to March and Meher (long rains) from June to September. According to IPMS (2005), the district is classified into two major farming systems,

pulse/livestock system (Barley, Wheat, pluses and small ruminants) and apiculture/livestock system (livestock and apiculture system). Nine of the sixteen Peasant Associations are under pulse/livestock system and are found starting from the central southern parts of the district to the tip north. Barley is the dominant crop in the area followed by wheat and pulses. The altitude of these PAs in this farming system is mostly around 2600 mals or higher and as result of this, frost is one of the major production problems in the area. The important marketable crop commodities in this area are pulses (faba been, field pean and lentils, in the order). Sheep fattening, dairy apiculture (queen rearing) and horticultural crops are also other important marketable commodities in the district.

The average household land holding of the area is about 0.5 ha of which about a third of the land area could cover by the pulses (IPMS, 2005).Temperate fruits (apple, pear and plum) are also potential fruit crops that could be grown in this farming system. Bee queen rearing is also important in this farming system while honey production is more important in the escarpments to the east. The district has a long escarpment of more than 60 km adjacent to the Afar region. The apiculture/livestock farming system is where altitude is below 2600 masl and major grown in this area are wheat, teff and barley. There are 7 PAs that belong to this farming system.

According ARDO (2008), honey production from local hives is on average about 8.4kg/harvest as opposed to the improved hives that can yield 20-35kg/harvest and it is possible to harvest twice a year. Price of white honey could range from 30 Birr/kg to 45 Birr/kg from the production season (surplus) to deficit season. The population of livestock in Atsbi Wemberta district is 52,482, 86,006, 12,375, 10,882 heads of cattle, sheep, goats and equines, respectively. The number of poultry is estimated at about 47,265. Out of the cattle population, the district has an estimated 16,415 drought oxen. There are 18,567 bee colonies of which 5,740 are improved box hives. There is also bee forage planting practices in the study area such as supplementary feeding which includes sugar, barley flour, peas and beans flour. In both the traditional and modern beehives supplementary feed is provided. In the study area there is also an extension activity which encourages beekeepers to grow indigenous bee forage such as (in Tigrigna) “gribiya” (Hypostus ariculata) and “tebeb” (Basium

clandiforbium). These plants are herbaceous and have high contribute in to honey production of the area.

### 3.2. Method of Data collection

In order to get the over all picture of honey producers, traders, and consumers of the honey marketing chain in the study area, the study was used both primary and secondary data. The primary data were collected using two types of questionnaires, one for farmers (honey producers) and the other for honey traders. The primary data collected from farmers focused on factors affecting honey market supply, size of output, market information, credit access, access to market, number of beehives owned, honey production cost, annual return from honey, extension service, annual income from non-honey source and demographic characteristics of the household. Moreover, the questionnaire for traders includes type of business (wholesaler, retailer, assembler, etc.), buying and selling strategies, initial capital, current working capital, source of working capital, source of market information, demographic characteristics of the traders and other related data were collected.

Independent questionnaires were designed for both honey producers and traders. Enumerators who have college diploma working in the district rural area as development agents were recruited and trained on the techniques of data collection. After they were made aware of the objective of the study and content of the questionnaires, a pre-test was conducted under the supervision of the researcher. Some adjustments were made to the questionnaire and the final data used in the research were collected under continuous supervision to ensure an appropriate data collection. In addition to the questionnaire, an informal survey in the form of Rapid Market Appraisal (RMA) technique was employed using checklists for both farmers and traders to obtain additional supporting information for the study. Secondary data were collected from different published and unpublished sources, such as government institutions, the District Office of Agriculture and Rural Development (DOARD), Tigray agricultural marketing promotion agency (TAMPA), reports, bulletins, and websites were consulted to generate relevant secondary data on honey production and marketing.

### 3.3. Sample Size and Method of Sampling

The sample frame of the study was the list of households in Atsbi Wemberta District and PAs, which are found in the district. A two stage sampling procedure was employed to select a specific honey producer household. First, three potential honey producer PAs from the District were selected through purposive sampling method. In the second stage, using the population list of honey producer farmers from sample PAs, the intended sample size was determined proportionally to population size of honey producer farmers. Then the 120 representative household were randomly selected using systematic random sampling technique (Table 4).

Table 4. Sample distribution of farmers (honey producers)

| Name of PA | honey producer Households | Sample households |
|---|---|---|
| Barkaadisewha | 554 | 40 |
| Hayelom | 700 | 50 |
| Dibabakorea | 416 | 30 |
| Total | 1670 | 120 |

Source: Survey result, 2008

The sites for the trader's survey were market towns, which were selected based on the flow of the honey produce in the study district. Three market towns (Mekelle, Wukro and Atsbi) were sampled. The sample size of honey traders were fourteen, hence, the number of permanent honey traders in the main honey marketing channel in the study area were very limited, and almost all of them were employed in the traders' survey.

Table 5. Sample distribution of honey traders'

| Market center | Retailers | Honey collectors | Process/retailer | Total |
|---|---|---|---|---|
| Mekelle | 8 | | 1 | 9 |
| Wukro | 2 | | | 2 |
| Atsbi | 1 | 2 | | 3 |

Source: Survey result, 2008

### 3.4. Method of Data Analysis

In this study, both descriptive and econometric methods of data analysis were employed. Descriptive statistics like mean, standard deviation and percentiles have been used to explain basic characteristics of the channel members besides econometric models. For this study, the data collected from the sampled producers and traders was first analyzed using descriptive statistics followed by determinants analysis of honey supply using econometric model.

#### 3.4.1. Market structure

Examining the nature of horizontal relationships between similar enterprises is analogous to analyzing the structure of the market as defined by the Industrial Organizational School. Analyzing market structure entails understanding of those characteristics of the organization of the market influencing the nature of competition and pricing (Scarborough and Kydd, 1992).

Structural characteristics like market concentration, industry maturity, product differentiation, government participation, barriers to entry and exit, will be some of the basis to be considered. In this regard, one can categorize markets as perfectly competitive, monopolistic,

or oligopolistic (Bain, 1968; cited in Pomeroy and Trinidad, 1995). Among the major structural characteristics of a market is the degree of concentration, that is, the number of market participants and their size distribution and the relative ease or difficulty for market participants to secure an entry into the market (Gebremeskel *et al.*, 1998).

**Market Concentration-** Market concentration is defined as a number and size distribution of sellers and buyers in the market. Other factors, such as the firm's objectives, barriers to entry, economics of scale, and assumptions about rival firm's behavior, will all be relevant in determining the degree of concentration, the relationship between concentration and behavior and performance (Scherer, 1980).

$$MS_i = \frac{V_i}{\sum V_i} \quad (1)$$

Where $MS_i$ = Market share of buyer i.

$V_i$ = Amount of product handled by buyer i.

$\sum V_i$ = Total amount of product

$$C = \sum_{i=1}^{r} s_i \quad (2)$$

Where C = concentration ratio handle

$S_i$ = percentage share of $i^{th}$ firm

r = number of largest firm for which the ratio is going to be calculated

### 3.4.2. Market conduct

Market conduct refers to the behavior of firms or the strategies used by the firms in their pricing, buying and selling activities. There are no agreed up on procedures for analyzing the element of market conduct. Market conduct defines the conditions which make possible exploitative relationships between sellers and buyers. This is done via unfair price setting

practices which Smith (1985) classified as collusive, predatory, or exclusionary. A systematic way to detect indication of unfair price setting practices and the condition under which practices are likely to prevail. Moreover, they cover the following topics:(i) the existence of formal and informal marketing groups that perpetuate such practice;(ii) formal and informal producer groups that affect bargaining power; (iii )the distance from the major market and its impact on prices; and (iv )the feasibility of utilizing alternative market outlets. The questions also provide an indication of the type of data needed and data collection procedures.

### 3.4.3. Market performance

Market performance refers to the impact of structure and conduct on prices, costs, and volume of output (Pomeroy and Trinidad, 1995). Marketing efficiency is essentially the degree of market performance. It is defined as having the following two major components: (i) the effectiveness with which a marketing service would be performed and (ii) the effect on the costs and the method of performing the service on production and consumption. These are the most important because the satisfaction of the consumer at the lowest possible cost must go hand in hand with maintenance of a high volume of farm output (Ramakumar, 2001).The two approaches to measure marketing performance are: marketing margin and the analysis of market channel efficiency.

**Marketing Margin**- In a commodity subsystem approach, the institutional analysis is based on the identification of the marketing channels. This approach includes the analysis of marketing costs and margins (Mendoza, 1995). A marketing margin can be defined as a difference between the price paid by consumers and that obtained by producers; or as the price of a collection of marketing services that is the outcome of the demand for and supply of such services (Tomek and Robinson, 1990). It measures the share of the final selling price that is captured by a particular agent in the marketing chain (Mendoza, 1995). It, in its simplest form, can be defined as the difference between prices paid for a commodity (e.g. bread) by consumers at a retail level, and prices received by farmers when they sell their commodity (e.g. wheat) to assemblers or other first handlers. Measured in this form, the margins reflect

the amount of services added to a commodity once it leaves the farm and sits on a shelf in a retail outlet in a form that is acceptable, useful, and appealing to consumers (Goetz and Weber, 1986).

Marketing margin is most commonly used to refer to the difference between producer and consumer prices of an equivalent quantity and quality of a commodity. However, it may also describe price differences between other points in the marketing chain, for example between producer and wholesale, wholesale and retail, prices (Scarborough and kydd, 1992). The size of marketing margins is largely dependent upon a combination of; the quality and quantity of marketing services, and the efficiency with which they are undertaken and priced. The quality and quantity of marketing services depends on supply and demand of marketing services and/or the degree of competition in the market place. The costs of service provision depend on both exogenous and endogenous factors and the efficiency are determined by the extent of competition between marketing enterprises at each stage.

According to Trotter (1992), the benchmarks to which results of marketing margin to be compared with are, the assumption of the margin to be equivalent to transfer cost as well as the constancy of margin per unit of product. Large gross margins may not express high profit but rather; increased qualities and quantities of service; low labor, capital and management productivity. Conversely, small gross margins may co-exist with inefficient use of resource; poor coordination and consumer satisfaction; and disproportionate profit elements. Thus, higher marketing margins resulting from increased services, including better coordination, may leave producers and consumers better off, and low margins may be due to low productivity. Therefore, in using market margin analyses to assess the economic performance of markets, it is always preferable to deconstruct them in to their cost and return elements (Scarborough and Kydd, 1992). However, the challenges of data availability on costs usually create a problem.

Tomek and Robinson (1990) also warned that marketing margins provide only one point of reference in the evaluation of performance and should be compared with measures of profits earned by marketing firms to determine whether or the margins are excessive. All these reviewed literatures advised not to exclusively depend on marketing margin for decision making but to support with other tools. Hence, in this study four parameters are included to judge an overall market performance. When there are several participants in the marketing chain, the margin is calculated by finding the price variations at different segments and then comparing them with the final price to the consumer. Consumer price is the base or common denominator for all marketing margins (Mendoza, 1995). The relative size of various market participants' gross margins can indicate where in the marketing chain value is added and/or profits are made.

Marketing costs and margin analysis is especially comparison of prices at different levels of marketing over the same period. Computing the total gross marketing margin (TGMM) is always related to the final price or the price paid by the end consumer and is expressed in percentage (Mendoza 1995).

$$TGMM = \frac{Consumer\ \ price - producer\ \ price}{Consumer\ \ price} \times 100 \qquad (3)$$

It is use full to introduce here the idea of "producer participation", "producer portion" or "farmers portion", or "producers gross margin" (GMMP) which is the proportion of the price paid by consumer that belongs to the producer. Producer that act as a middle men also receive an additional marketing margin.

$$GMMp = \frac{\text{Price paid by the Consumer} - Marketing\ gross\ margin}{Price\ paid\ by\ the\ Consumer} \times 100 \qquad (4)$$

In marketing chain with only one trader between producer and consumer, the net marketing margin (NMM) is the percentage over the final price earned by the intermediaries as his/her net income once his marketing costs are deducted.

$$NMM = \frac{Gross\ marg\quad in\ -\ Marketing\quad Cost}{Price\ paid\quad by\ the\ co\quad nsumer} \times 100 \qquad (5)$$

Another parameter related to marketing margin is the producer's share. The producer's share is the ratio of producer price (ex-vessel) to consumer price (retail) (Mudiantono, 1990). The producer's share can be expressed as

$$PS = \frac{P_x}{P_r} = 1 - \frac{MM}{P_r} \qquad (6)$$

Where: PS =the producer's share

$P_x$ = producer price of honey

$P_r$ = Consumer price of honey

MM = Marketing margin

The above equation tells us that a higher marketing margin diminishes the producer's share and vice-versa. It also provides an indication of welfare distribution among production and marketing agents. The magnitude of marketing cost depends on factors such as time and place of marketing, market conditions, and the market channel involved. The marketing will be composed with marketing service cost and the result will be interpreted. Margins at each stage will be computed and the share will be compared.

### 3.4.4. Supply function

A number of studies investigated about factors that mainly affect marketable supply of agricultural commodities. Among others, Wolday (1994) pointed out the major factors that influenced the marketable supply of teff, maize and wheat at Alaba Siraro district using cross-sectional data and he investigated the relationship of farm level marketable supply of cereals to capture the influence of the independent variables on the marketable supply of food grain, he adopted multiple regression analysis with both dummy and continuous variables as explanatory variables. In his study, he found out that among the independent variable, access to market, size of output and family size had affected the marketable supply of food grain at the district. Another study by Wolelaw (2005) find out the major factors that affect the marketable supply of rice at Fogera district using multiple linear regression model. He investigated the relationship between the determinant factors of supply and the marketable supply of rice and her study revealed that the current price, lagged price, amount of rice production at farm level and consumption at household level had influenced marketable supply of rice at the district.

Similar study undertaken by Kinde (2007) indicated that, the major factors that affect marketable supply of sesame in Metema district by using cross-sectional data with dummy and continuous explanatory variables. In his study he implemented multiple linear regression model to identify the relationship between the marketable supply of sesame and the hypothesized explanatory variables, hence his study acknowledged that amount of sesame productivity, use of modern inputs, number of language spoken by the household head, number of oxen owned, sesame area and time of selling of sesame influenced marketable supply of sesame positively. Another related study by Rehima (2006) identified that the key factors that affecting marketable supply of red pepper at Alaba and Siltie districts of SNNPRS using cross-sectional data with both dummy and continuous independent variables. In her study, she employed Tobit model and came up with the finding that distance to the market, frequency of contacts with extension agents, quantity of pepper produced and access to

market information influenced marketable supply of pepper positively at the district. Recent studies are commonly using regression models to estimate the supply function. Likewise for this particular study, Linear multiple Regression model has been fitted to analyze and estimate supply of honey in Atsbi Wemberta district.

**Econometrics Model Specification**

Following Green (2003), the multiple linear regression model is specified as Y=f(price, honey output, access to market information, access to extension services, education level, experience in beekeeping, sex, access to credit, age, etc…).The econometric model specification of supply function in matrix notation is estimated by

$$Y = \beta X + U \qquad (7)$$

Where $Y_i$ = honey supplied to the market

$\beta$ = a vector of estimated coefficient of the explanatory variables

X= a vector of explanatory variables

$U_i$ = disturbance term

### 3.4.5. Determinants of marketable supply of honey production in Atsbi Wemberta

Tomek and Robinson (1985) suggested that careful definitions of terms are essential. Total supply in a specific period may depend not only on current production but also on carry over stocks and imports. It is not possible to include an exhaustive set of variables that could affect the household level of marketable supply of the product. But, in this particular study, an attempt was made to estimate determinants of marketable supply of honey production in Atsbi Wemberta district. In the course of identifying factors influencing honey supply, the main task is to analyze which factor influences and how? Hence, potential variables which are supposed to influence the quantity of honey supply need to be explained. Accordingly, the main

variables expected to have influence on quantity supply of honey are explained in the following manner.

### 3.5. Definition of Variables

#### 3.5.1. Dependent variable

**Quantity Supplied (QTSUPP):** It is a continuous variable that represents the dependent variable; the actual supply of honey by individual households to the market, which is measured in kilograms.

**3.5.2. Independent variables:** The explanatory variables expected to influence the dependent variable are the following:

**Quantity of honey produced (QTYHP)**: It is a continuous variable measured in kilograms. The variable is expected to have positive contribution to the amount of honey supplied to the market. Farmers who produce more output per box beehives are associated to supply more honey to the market than those less produce.

**Distance to nearest market (DSNMKT)**: It is a continuous variable and is measured in kilometers which farmers spend time to sell their product to the market. If the farmer is located in a village or distant from the market, he is weakly accessible to the market. The closer to the market the lesser would be the transportation cost and time spent. Therefore, it is hypothesized that this variable is negatively related to marketable surplus of honey production. A similar study was conducted by Holloway *et al.,* (1999) milk-market development in the Ethiopian highlands. His result indicates that distance-to market causes market surplus to decline. Similar issue was studied by Wolday (1994) on food grain market in the case study of Alaba indicated negative relationship between distance from the household residence to grain market and volume of marketed food grain. Further more, study conducted by Abonesh (2005) and Rehima (2006) indicated similar results.

**Price of honey in 1999 E.C. (PRICE 99)**: It is a continuous variable and is measured in Birr per kilogram. This variable is expected to influence marketable supply positively. When the price of the product is promising, farmers are motivated to take their produced to the market. This makes the supply to be directly related to the current market price.

**Age of the household head (AGE)**: Age is demographic variable and is measured in years. The expected influence of age is assumed positive; it is a proxy measure of farming experience of household. Aged households are believed to wise and acquire skills in beekeeping hence produce much and supply more.

**Sex of the household head (SEX)**: This is dummy variable that takes a value of one if the household head is male and zero otherwise. Both men and women participate in beekeeping and production of honey. Male households have been observed to have a better tendency than female household in beekeeping and production and supply of honey due to obstacles such as lack of capital, and access to credit and extension services. Tshiunza *et al.*, (2000) discussed the determinants of market production of cooking banana in Nigeria. In their study the male farmers tended to produce more cooking banana for market than female farmers.

**Experience in beekeeping (EXP)**: This is a continuous variable, it refers to the number of years the farmer engaged in beekeeping activity and is expected to influence supply of honey to the market positively. As farmers got more experience in beekeeping, the probability of increasing production and hence supply would be higher. Moreover, farmers with longer farm experience will have a cumulative knowledge of the entire farming environment. This in turn enables them to adopt the use of improved box beehives earlier than farmers with short beekeeping farm experience.

**Access to market information (ACCMIF)**: This is measured as a dummy variable taking value of 1 if the producer had access to market information and zero otherwise. It has been hypothesized that to affect positively marketable honey supply of beekeeping household. The

better information farmers had out is likely to supply more honey to the market. The general idea is that maintaining a competitive advantage requires a sound business plan. Again, business decisions are based on dynamic information such as consumer needs and market trends. This requires that an enterprise is managed with due attention to new market opportunities, changing needs of the consumer and how market trends influence buying (CIAT, 2004).

**Extension service access to honey production (EXACC)**: This variable is measured as a dummy variable taking a value of one if the beekeeping household has access to honey production extension service and zero otherwise. It is expected that extension service widens the household's knowledge with regard to the use of improved box beehives technologies and has positive impact on honey volume of marketable surplus. Farmers that have frequently contact with DAs (development agents) will have better access to information and could adopt better technology that would increase their marketable supply of honey.

**Education level of the household (EDLHH)**: It is a continous variable and refers to the formal schooling of a respondent during the survey period. Those household heads who had formal education determines the readiness to accept new ideas and innovations, and easy to get supply, demand and price information and this enhances farmers' willingness to produce more and increase volume of sales. Holloway *et al.,* (1999) observed that education and visits by an extension agent had significant and positive effect on quantity of milk marketed in Ethiopian highlands.

**Access to credit (ACC):** Access to credit is measured as a dummy variable taking a value of one if the household has access to credit and zero otherwise. Among other things, credit access is assumed to have a positive significant to the marketable supply of honey, because a farmer who has access to credit service can purchase improved box beehives and hence increase the production and marketable supply of honey at the district level.

Table 6. Description of the dependent and independent variables used in the model

| Variables used in the model | Explanation | Category | Value |
|---|---|---|---|
| QTSUPP | Quantity supplied | Continuous | Kilograms |
| QTYHP | Quantity of honey produced | Continuous | Kilograms |
| DSNMKT | Distance to nearest market | Continuous | Kilometers |
| PRICE99 | Price of honey in1999 E.C. | Continuous | Birr |
| AGE | Age of the household head | Continuous | Number of years |
| SEX | Sex of the household head | Dummy | 0=female, 1=male |
| EXP | Experience in beekeeping | Continuous | Number of years |
| ACCMIF | Access to market information | Dummy | 0=no, 1=yes |
| EXACC | Extension service | Dummy | 0=no, 1=yes |
| EDLHH | Education level of the household head | Continuous | Years of schooling |
| CACC | Access to credit | Dummy | 0=no, 1=yes |

When the assumptions of the Classical Linear Regression (CLR) model are despoiled, the parameter estimates of the OLS model may not be Best Linear Unbiased Estimator (BLUE). Hence, it is important to check the presence of multicollinearity and heteroscedasticity among the variables that affect the supply of honey in the study area. Therefore, before fitting significant variables into the model for analysis, it was necessary to test multicollinearity problem among continuous variables and check associations among discrete variables, which seriously affects the parameter estimates. As Gujarati, (2003) pointed out multicolliniarity refers to a situation where it becomes difficult to identify the separate effect of independent variables on the dependent variable because there exists strong relationship among them. In other words, multicollinearity is a situation where explanatory variables are highly correlated. There are two measures, which suggested testing the existence of multicollinearity. These are Variance Inflation Factor (VIF) for a continuous variables association and Contingency Coefficients (CC) for dummy variables association.

To detect multicollinearity problem for continuous variables, variance inflation factor $(VIF) = \frac{1}{1 - R_j^2}$, for each coefficient in a regression as a diagnostic statistic is used. Here, $R_j^2$ represents a coefficient for determining the subsidiary or auxiliary regression of each independent continuous variable X. As a rule of thumb, if VIF value of a variable exceeds 10, which will happen if $R_j^2$ exceeds 0.90, then, that variable is said to be highly collinear (Gujarati, 2003). Therefore, for this study, variance inflation factor $(VIF)$ was employed to estimate the degree of multicollinearity among the explanatory continuous variables of supply function. On the other hand, contingency was used coefficient for dummy variables.

Conversely, test for heteroscedasticity had undertaken for this study. There are a number of test statistics for the detecting heteroscedasticity; According to Guiarati (2003) there is no ground to say that one test statistics of hetroscedasticity is better than the others. Therefore, due to its simplicity, Kroenker-Bessett (KB) test of heteroscedasticity was used for this study. Similar to other test statistics of heteroscedasticity, KB test is based on the squared residuals $u^2_i$. However, instead of being regressed on one or more regressions, the squared residuals are regressed on the squared estimated values of the regressand. Particularly, if the original model

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \ldots + \beta_K X_{Ki} + u_i \qquad (8)$$

$u_i$ is obtained from this model and then $\hat{u}^2$ is estimated as $\hat{u}_i^2 = \alpha_1 + \alpha_2 \hat{Y}_i^2 + V_i$

Where $\hat{Y}_i$ are the estimated values from the original model. The null hypothesis is $\alpha_2$ = zero. If this is not rejected, then, one can conclude that there is no heteroscedasticity. The null hypothesis can be tested by the usual t-test or F-test.

# 4. RESULTS AND DISSCUSSIONS

This section presents the results of descriptive and econometric analysis. The descriptive analysis describes the general characteristics of the sampled farm households and honey traders, and the honey marketing chains. The econometric analysis is used to identify factors that affect supply of honey in Atsbi Wemberta district.

## 4.1. Socio-economic Characteristics of Sample Households

This section provides the profile of the sample respondents with regard to their age, sex, religion, marital status and education level.

### 4.1.1. Household characteristics

Almost 100 percent of the respondents were Orthodox Christian. The way people interact with each other is reflected in their social norms and their culture. About 50 percent of the households heads were in the age group of 26-44 with an average age of 36.33 and 43.3 percent of the sample respondent were in the age group of 45-62 years with an average age of 52.52 (Table 7). About 7 percent of the household heads lie in the age range of 63-80. The overall mean age of the respondents was 45.6.

Table 7. Distribution of sample respondents by age of household heads

| Variable category | | Barika (n=40) | | Hayelom(n=50) | | Dibab (n=30) | | Total (n=120) | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| Age group (in years) | 26-44 | 19 | 38 | 24 | 60 | 17 | 56.7 | 60 | 50 |
| | 45-62 | 17 | 42.5 | 22 | 44 | 12 | 43.3 | 52 | 43.3 |
| | 63-80 | 4 | 10 | 4 | 8 | | | 8 | 6.7 |
| Mean age(years) | | | | | | | | 45.6 | |
| Mean family size(No) | | 6.03 | | 5.48 | | 5.2 | | 5.6 | |

Source: Survey result, 2008

The average family size of the sample farmers during the survey period was 5.6 persons, with maximum and minimum family size of nine and two persons, respectively. These figures are 6.03, 5.48, and 5.2 persons for Barikaadisewha, Hayelom and Dibabakoren in that order (Table 7). Out of the total sampled households in the study area, 96 percent were male-headed (Table 8). This conforms to the common thinking that beekeeping is men's job due to labor requirements. In line with this, Hartmann (2004) reported that in Ethiopia traditionally beekeeping is men's job. Regarding the marital status, most of the household heads surveyed (97 %) were married with only 2.5 percent divorced household head.

Table 8. Distribution of sample respondents by sex of household heads

| Variable | | Barika (n=40) | | Hayelom (n=50) | | Dibab (n=30) | | Total (n=120) | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| Sex | Male | 37 | 92.5 | 48 | 96 | 30 | 100 | 115 | 95.8 |
| | Female | 3 | 7.5 | 2 | 4 | | | 5 | 4.2 |

Source: survey result, 2008

The average number of years of schooling completed was 1.92 years for the respondents. Among the sampled respondents, about 21 percent were illiterate, while a greater majority (72.5%) of them can read and write (Table 9). The rest of the respondents attended from elementary to junior School. More specifically, 4.2 and 2.5 percent of the sample respondents had attended elementary and junior schools respectively.

Table 9. Education status of the households

| Variable category | | Barika (n=40) | | Hayelom(n=50) | | Dibab (n=30) | | Total (n=120) | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| Education | Illiterate | 9 | 22.5 | 13 | 26 | 3 | 10 | 25 | 20.8 |
| | Read &Write | 29 | 72.5 | 34 | 68 | 24 | 80 | 87 | 72.5 |
| | 1-6 grade | 1 | 2.5 | 2 | 4 | 2 | 6.7 | 5 | 4.2 |
| | 7-8 grade | 1 | 2.5 | | | 2 | 6.7 | 3 | 2.5 |

Source: Survey result, 2008

### 4.1.2. Honey production characteristics

Honey production is an important source of household income in the region. Atsbi Wemberta is one of the districts of Trigray Region with high potential for beekeeping development. According to Atsbi Wemberta BOARD (2008), the district has 18,567 honeybee colonies making it one of the high potential areas for developing beekeeping in the region as well as in the country. The annual crude honey produced in 2007/08 per traditional box beehives was 12.77 Kg and that of improved one was 35.75 Kg. The number of honeybee colony holding size for the production of honey per household by PAs in the sampled three PAs is summarized in table10. The entire 120 sample farmer's honeybee colony holding size in the study area ranges from 1 to 12 box beehives and the majority (62.5%) of sample farm household owned 1-3 bee colonies during the survey period. While 35 and 2.5 percents of the sample households honey bee colony holding size was 4-6 and greater than 6, respectively (Table10).

Table 10. Honey bee colony holding size of sample farmers

| Variable category | | Barika (n=40) | | Hayelom (n=50) | | Dibab (n=30) | | Total (n=120) | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| Bee colony holding size (number) | 1-3 | 27 | 67.5 | 31 | 62 | 17 | 56.7 | 75 | 62.5 |
| | 4-6 | 12 | 30 | 18 | 36 | 12 | 40 | 42 | 35 |
| | > 6 | 1 | 2.5 | 1 | 2 | 1 | 3.3 | 3 | 2.5 |
| Mean | | | | | | | | | 3.45 |

Source: Survey result, 2008

In order to improve the quality and quantity of honey produce, the Agricultural and Rural Development (ARD) Office and different non-governmental organizations have introduced improved box hives in Atsbi Wemberta. According to the secondary data obtained from the district Office of Agriculture and Rural Development, out of the total 5740 improved box beehives found in the district, 1670 or about 30 percent of the improved box beehives was concentrated in the sampled three PAs at the time of survey.

### 4.1.3. Experience in beekeeping

The level of beekeeping experience is taken to be the number of years that an individual was continuously engaged in beekeeping activity. Majority (79%) of the respondents had about 3-8 years of beekeeping experience (Table 11). The average years of experience for the entire sample was about 7 years, the minimum and maximum years of experience being 3 and 30 years, respectively. This shows that the activity was introduce or started in the area about many years ago. Having cumulative knowledge of how to keep bees is a prerequisite to the ability to obtain process and use information related to the practice.

Table 11. Distribution of respondents by beekeeping experience

| Variable category | | Barika (n=40) | | Hayelom (n=50) | | Dibab (n=30) | | Total (n=120) | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| Experience in bee keeping | 3-8 years | 26 | 65 | 40 | 80 | 29 | 96.7 | 95 | 79.2 |
| | 9-15 years | 5 | 12.5 | 3 | 6 | 1 | 5.3 | 9 | 7.5 |
| | 16-20 years | 8 | 20 | 6 | 12 | | | 14 | 11.7 |
| | > 20 years | 1 | 2.5 | 1 | 2 | | | 2 | 1.6 |

| | |
|---|---|
| Mean | 6.9 |

Source: Survey result, 2008

### 4.1.4. Beekeeping equipments and their sources

During the survey, respondents were found to make use of box beehives that were drawn from different sources. It was found that all improved box beehives were prepared in private small and micro enterprise manufacturing centers organized by youth and provided by Agricultural and Rural development Office of the district and different non- governmental organizations on credit basis. At the time of survey, the price of one improved box beehives was Birr 664.

When asked to list the equipments they use including their prices and duration, the respondents mentioned a wide range of accessories, prices and service periods that goes hand in hand with beekeeping practices. The full ranges of accessories are the following: smokers, gloves, bee veils, boots, water sprayer, bee brush, queen lauder, knife, honey container, honey presser, and honey extractor. It was learnt during the survey that, apart from the known basic hive tools many of the materials are either non-existent or kept by quite few number of respondents. Particularly, the honey extractor was reserved at the center of the PAs for demonstration purpose.

### 4.1.5. Honey production

Honey is harvested in the study area from August to December (peak periods) in each year. Among the total 120 respondents 75 percent of them harvest honey twice within this period of the year, whereas 25 percent of the sample farmers respond that they harvest once in a year in the same period. It was reported that any production obtained in the remaining periods of the year would be left as food for the colony to strengthen it for the next harvest. As indicated in table 12, the total annual production obtained by sample respondents from 414 improved box beehives during the survey period was estimated at 11,865 kg.

Table 12. Distribution of respondents by annual total production obtained from their hives

| Honey production category | | Barika (n=40) | | Hayelom (=50) | | Dibab (n=30) | | Total (n=120) | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| Honey production | 25-65 | 3 | 7.5 | 31 | 62 | 2 | 7.7 | 36 | 30 |
| | 66-110 | 7 | 17.5 | 18 | 36 | 10 | 33.3 | 35 | 29.2 |
| | 111-156 | 28 | 70 | 1 | 2 | 13 | 43.3 | 42 | 35 |
| | 157-200 | 1 | 2.5 | | | 3 | 10 | 4 | 3.3 |
| | >200 | 1 | 2.5 | | | 2 | 6.7 | 3 | 2.5 |
| Total hives | | | | | | | | | 414 |
| Total annual production (kg) | | | | | | | | | 11865 |
| Mean production/hives (kg) | | | | | | | | | 28.66 |
| Mean production/households (kg) | | | | | | | | | 98.89 |

Source: Survey result, 2008

The annual average production of the sample respondents was 98.89 kg in the same year. On the other hand, average production/improved box beehives was 28.66 kg (Table 12). The survey result also shows that the production per households ranged from 25 kg to 415 kg, and about 35 percent of respondents reported that their annual production during the time was between 111 kg and 156 kg. In the same manner, 30 and 29.2 percent of respondents reported that their annual production was between 25-65 kg and 66-110 kg, respectively. However, only few respondents score the highest production (3.3 and 2.5) percent, in that order.

### 4.1.6. Annual income earned by sample respondent from the sale of the commodity

Atsbi Wemberta honey is used for consumption, not for tej making. During the survey, with the given size of holding of improved box beehives, the total annual gross income of sample farmers from the sale of 11,257 kgs of honey output at an average price of 37.35 Birr/kg was estimated at Birr 420,448.95 (Table 13).

Table 13.Distribution of sample farmers by annual total gross income earned from the sale of honey

| Income category | | Barika (n=40) | | Hayelom (n=50) | | Dibab (n=30) | | Total (n=120) | |
|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | n | % |
| Income (in Birr) | 875-1875 | | | 26 | 52 | 2 | 6.7 | 28 | 23.3 |
| | 1876-2875 | 2 | 5 | 15 | 30 | 7 | 23.3 | 24 | 20 |
| | 2876-3876 | 1 | 2.5 | 9 | 18 | 4 | 13.3 | 14 | 11.7 |
| | 3877-4876 | 6 | 15 | | | 10 | 33.3 | 16 | 13.3 |
| | 4877-5876 | 30 | 75 | | | 5 | 16.7 | 35 | 29.2 |
| | >5876 | 1 | 2.5 | | | 2 | 6.7 | 3 | 2.5 |
| Mean income (Birr) | | | | | | | | 3503.74 | |

Source: Survey result, 2008

The annual gross income of respondents from the sale of honey output in the study area ranged from Birr 875 to Birr 9720. As shown in Table 13, the maximum proportion (29.2%) of sample respondents earned an annual gross income of between 4876 to 5876 Birr and about 23.3% of sample households obtained 875-1875 Birr. On the other hand, very few

respondents (2.5%) obtained annual income of above 5,876 Birr. Likewise, the mean annul gross income per sample households during the survey time was about Birr 3504.

### 4.1.7. Access to services

Access to different services could be essential to improve production and productivity of smallholder's farmers. More specifically, access to credit, access to extension contact and market information, are the most important factors that promote production and marketing of honey production and thereby increase income of the producer are displayed below in table 14. However, from the total sample households who were asked to know whether they need credit or not, about 72 percent of the sample households pointed out that they needed credit for honey production but only 17.4 percent of them had received some amount of Birr (650-3000 Birr). The reason for the low percentages of respondents who had access to credit service was because of the high interest rate charged by private lenders (DCSI). Table 14 also indicate that, even though farmers in the study area need credit to purchase different inputs to enhance the quantity and quality of the honey production, the short repayment period as well as the high interest rate of the service was not suitable to the individual respondents. Moreover, at the time of survey it was understood that, the only private institution that deliver credit in the district is DCSI.

Apiculture extension service is provided by the district Agriculture and Rural Development Office. Each sampled PAs has three Development Agents (DAs). As a result, about 83 percent of the sample respondents had access to extension service to promote the apiculture sector and thereby increase the quantity and quality of the commodity at farm level (Table 14).

Table 14. Proportion of farmers with access to credit, extension service and market information.

| Variable | Barika (n=40) | | Hayelom(n=50) | | Dibab (n=30) | | Total (n=120) | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| Credit need (yes) | 27 | 67.5 | 38 | 76 | 21 | 70 | 86 | 71.7 |
| Credit accessed (yes) | 5 | 12.5 | 8 | 16 | 2 | 6.7 | 15 | 17.4 |
| Credit amount taken (Birr) | 3550 | | 8650 | | 2150 | | 14350 | |
| Extension contact (yes) | 34 | 85 | 42 | 84 | 23 | 76.7 | 99 | 82.5 |
| Access to nearby market information (yes) | 32 | 80 | 43 | 86 | 26 | 86.7 | 101 | 84.2 |
| Access to Mekelle market information (yes) | 2 | 5 | 10 | 20 | 3 | 10 | 15 | 12.5 |
| Source of Infon. Coop. (yes) | 10 | 25 | 16 | 32 | 8 | 26.7 | 34 | 28.3 |
| on market (yes) | 25 | 65.5 | 31 | 62 | 15 | 50 | 71 | 59.2 |

Source: Survey result, 2008

With regard to access to the market information, 84.2% and 12.5% of the sampled respondents had access to the nearby market price information and at Mekelle price information of honey, respectively (Table 14). The survey result presented in Table 14 also shows that honey producers were limited to some source of market information. Accordingly, 28.5% and 59.2% of the total sampled households respond that, they obtain price information from multipurpose cooperatives and personal observation on market, respectively.

### 4.1.8. Demographic characteristics of traders

The demographic characteristics of traders summarized in terms of age, sex, marital status, education level, religion and average experience in honey trading (Table15). The age of traders ranged from 26 to 42 with an average age of 30 years old. The survey result indicates that, all the sample honey traders are males and about 93 percent of them were married. With regard to religion, 85.7 percent and 14.3 percent of the sampled traders were Orthodox Christian and Muslim, respectively. About 64 percent and 21.4 percent of the sample traders were within the level of Primary and Secondary School education, respectively, and only 14.3 percent of the traders have some kind of tertiary education. Table15 also indicates that traders had 6.3 years of experience on honey trading on the average.

Table 15**.** Demographic characteristics of sample traders

| Variable | | Number of traders | percentage |
|---|---|---|---|
| | Male | 14 | 100 |
| Sex | Female | 0 | |
| Religious | Orthodox Christian | 12 | 85.7 |
| | Muslim | 2 | 14.3 |
| | Diploma | 2 | 14.3 |
| | 7-10 grade | 3 | 21.3 |
| Education level | 1-6 grade | 9 | 64.3 |
| | Married | 13 | 93 |
| Marital status | Single | 1 | 7 |

Source: Own computation, 2008

**Financial capital of sample honey traders:** Table 16 shows that average initial and current working capital of honey traders during the survey period was estimated to be Birr 1381.5 and Birr 5977.8, respectively. Moreover, as it was indicated in Table 16, the current working capital of honey traders was about 5 times greater than their initial working capital and the initial and current working capital of the honey trades varies from Birr 250 to 5000 and Birr 2000 to 30000, respectively. With regard to the sources of working capital, 44.4 percent, 50 percent and 50 percent of honey traders reported that their source of current working capital was own saving and credit in Mekelle, Wukro and Atsbi, respectively. Table 16 also indicated that honey traders in Mekelle, Wukro and Atsbi, respectively reported that 44.6 percent, 50 percent and 66.7 percent of their current source of working capital was from DCSI. Only 11 percent of honey traders found in Mekelle indicated that their source of working capital was obtained as gift from their families.

Table 16. Financial capital of sampled honey traders

| Descriptive statistics | | Mekelle | Wukro | Atsbi |
|---|---|---|---|---|
| Initial working capital (Birr) | Mean | 2111.10 | 1050 | 983.3 |
| | Minimum | 500 | 300 | 250 |
| | Maximum | 5000 | 1800 | 1500 |
| Current Working Capital (Birr) | Mean | 9166.7 | 4000 | 4766.67 |
| | Minimum | 3500 | 2000 | 3800 |
| | Maximum | 30000 | 6000 | 6000 |
| Source of current working capital | Own saving & credit | 44.4 | 50 | 33.3 |
| | DCSI | 44.6 | 50 | 66.7 |
| | Donation | 11 | | |

Source: Survey result, 2008

### 4.2. Production and Marketing Problems and Opportunities

Beekeepers confronted with several problems related to production and marketing. Major problems in beekeeping arise from bee characteristics and environmental factors that are beyond the control of the farmers. A questionnaire was designed as part of the study with the objective of identifying the existing problems limiting development of the apiculture sector in the study district. Table 17 summarized major constraints identified and prioritized by the respondents.

Table 17. Beekeeping problems encountered by sample respondents

| Type of problem | % of respondents replied (n=120) |
|---|---|
| Shortage of bee forage ( drought) | 75 |
| Absconding honeybee | 52 |
| Disease and pests | 45 |
| Lack of beekeeping equipments | 38 |
| Death of colony | 32 |
| Marketing problems | 28 |
| Lack of adequate beekeeping skill | 18 |
| Reduction of honey bee colony | 17 |
| Credit | 15 |

Source: Survey result, 2008

It can be seen from Table 17 that the most serious problem faced by respondents in order of their importance were shortage of bee forage (drought), followed by absconding honey bee, disease and pests, lack of beekeeping equipments, death of colony, marketing, lack of beekeeping skill, reduction of honey bee colony and credit. Shortage of bee forage (drought)

is the primary constraint in beekeeping development identifying by farmers in the study area during the survey. It affects the feed source (bee forage) and water adversely. IPMS (2005) documented that the major source of feed in the district is from the natural bush (about 70% of the requirement) and the rest are from home-prepared pulse flour and sugar. Another problem mentioned is that of rust which affects the flower, because of which the honeybee cannot get nectar and pollen. Therefore, the honeybee colony absconds to areas where resources are available for their survival. The prevalence of disease and pests also forces the colonies to abscond. In order to enable safety protective materials such as veil, glove, overall and smoker is essential for the beekeeper farmers. In the study area, though the distribution of improved box beehives was encouraging, in most cases the protective materials did not accompany them.

Respondents reported that death of colonies/affected of bees by agro chemicals, due to the draining of chemicals used in the animal health center of the PAs in to water source of the area, from which honeybees use the water was another problem. Honey is produced mainly for marketing in the district. Households sell about 80-90% of the honey produced (IPMS, 2005). The increased honey production during the harvest period was found to coincide with high supply in the study area. This brings a down ward pressure on honey price in the high supply seasons mainly in Atsbi Wemberata district. Beekeepers generally supply to markets in nearby towns like Atsbi and Wukro, traveling on foot. The farmers sell the honey they produce on individual basis mainly to consumers and private traders twice a year. Among producers, on average about 10-20 kg of honey is sold per household per annum (IPMS, 2005). They are price takers and have low bargaining power. Despite the high honey, production in the district there is no ready market which attracts farmers.

**Honeybee Management Practices**

About 59 percent of the respondents visit their bees every day while 33.3 percent of them visit their bees at every three days and the rest visit their bees to check if the hive was occupied with bees and at least during honey harvesting seasons. Internal hive inspection is almost not practiced by most of the farmers. About 90 percent of the farmers responded that they clean the areas around the box beehives and put ash under the hives to avoid small ant and ant like insects from climbing the box beehives. While the rest 10 percent do not clean. About 65 percent of the interviewed farmers gave additional food and water for their bees in order not to lose them and hence to harvest honey in the second honey fallow seasons.

During the survey period it has been also observed that some farmers who have improved box beehives do not manage it properly. This might be due to lack of adequate training and better knowledge how to manage improved beekeeping practices, lack of supervision or follow up after distribution by the district Agriculture and Rural Development Office and non-governmental organizations and might be also be due to carelessness of the farmers. Some of the improved box beehives did not have stand but kept in inappropriate places.

**Traders marketing problems**:

Table 18 summarized the basic problems identified and prioritized by sample traders. As the table indicates the basic problems faced by honey traders' during the survey were quality problem (adulteration), competition with unlicensed traders, and shortage of finance, demand and unfair tax fee. Quality problem is the priority problem identified by honey traders. Improving the quality of honey has to do with production, harvesting and storing by farmers. As farmers reported one of the reasons for quality problem could be low beekeeping skills. The other problem for the poor quality of honey that traders noted is that there are unlicensed traders/honey collectors who might be mixing honey with sugar.

Table 18. Marketing problems of honey traders

| Type of problem | % of respondents replied (n=120) |
|---|---|
| Quality | 64.5 |
| Competition with unlicensed traders/honey collectors | 49.6 |
| Shortage of finance | 21.4 |
| Tax | 14 |
| Demand | 7.9 |

Source: Survey result, 2008

About 50 percent of the honey traders confirmed that they faced competition with unlicensed traders; about 22 percent of them indicated that they face financial shortage to run and expand their business. Table18 also indicated that 14 percent of the sample traders complain that they were forced to pay unfair tax and about 8 percent of the sample traders reported that they faced demand problems due to limited number of buyers, high supply of honey in other areas of the region.

**Opportunities**

There are important honey production opportunities in Atsbi Wemberta district. Among the different opportunities, the existence of conducive policy framework in the agricultural sector development manifested by assigning three development agents in each PAs and infrastructure development could facilitate honey production and marketing. The existence of some development projects like IPMS-ILRI input supply/credit for honey production (supply of bee colony) and to create a link between buyers and farmers is another opportunity for

farmers of the district. There is also governmental institution named as Tigray Agricultural Marketing Promotion Agency (TAMPA) that disseminates weekly average prices of agricultural commodities through the regional mass media on weekly basis. Moreover, a private company, Dimma Enterprise, which has recently installed a honey processing plant in Adigrat, the zonal capita, about 93 km from the study district is also another chance for honey marketing of the study area since it creates demand for honey.

### 4.3. Market Structure

In this section of the study, honey market participants, their roles and linkages, the marketing channel of honey production, the conduct and as well as the performance of honey market are presented one after the other.

#### 4.3.1. Honey marketing participants, their roles and linkages

In this study, different honey marketing participants were identified. Honey marketing participants in the study area includes producers/farmers, honey collectors/assemblers, retailers, processors and final consumers of the product.

**Producers:** Producers/farmers sell their honey to different buyers involved in honey in the market at village or district market center. The market place that is the closest to the residence of the farmers is the first chosen with regard to minimization of transportation costs. According to the respondents, in 2006/07 production year, 43.3 percent, 34.8 percent, 14.4 percent and 7.4 percent of their annual sale of honey was sold to consumers, honey collectors, retailers and processor, respectively.

Table 19. Amount of honey output supplied (kg) to different market participants by farmers in 2006/07 production year

| Market participants | Amount sold | % |
|---|---|---|
| Consumers | 4876 | 43.4 |
| Honey collectors | 3921 | 34.8 |
| Retailers | 1622 | 14.4 |
| Processor | 838 | 7.4 |
| Total | 11257 | 100 |

Source: Survey result, 2008

**Honey collector/assembler:** Rural actors play an important role in honey assembly. The honey collectors found in the study area purchased the honey produce directly from farmers in a small village markets for resell to other collectors, retailers, and consumers who come from different areas of the region at the district market center.

**Retailers**: There are supper markets and other retailers who divide large-scale shipments of produce and sell it to consumers in small units. These are the final link in the channel that delivered honey to end users. The majority of honey retailers found at the regional as well as district centers have their own stores and retail shops.

**Processor:** This is a private enterprise recently established in Adigrat. The processor purchase honey from different areas of the region including the study area directly from farmers or from rural collectors and has a retail shop in the regional town. The processor used different packing material ranged from 1kg to 30kg.

**Consumers:** From the consumers' point of view, the shorter the marketing chain, the more likely is the retail price going to be affordable. Consumers for this particular study mean those households who bought and consume honey. They are individual households; they bought the commodity for their own consumption only.

### 4.3.2. Honey marketing channel

According to Mendoza (1995), marketing channel is the sequence through which the whole of honey passes from farmers to consumers. The analysis of marketing channel is intended to provide a systematic knowledge of the flow of the goods and services from their origin (produce) to the final destination (consumer). During the survey, the following honey marketing channels were identified.

**Channel I** Farmers → honey collector→retailer→consumer (15.7%)

**Channel II** Farmers→honey collectors'→processors→consumers (9.7%)

**Channel III** Farmers →retailers'→consumers (14.4%)

**Channel IV** Farmers→consumers (43.4%)

**Channel V** Farmer→honey collectors'→consumers (9.4%)

**Channel VI** Farmer→Processor→ consumers (7.4%)

As can be understood from fig 1, the main receivers from the farmers were consumers, honey collectors, retailers and processors with an estimated percentage of 43.4, 34.8, 14.4 and 7.4 percent in that order.

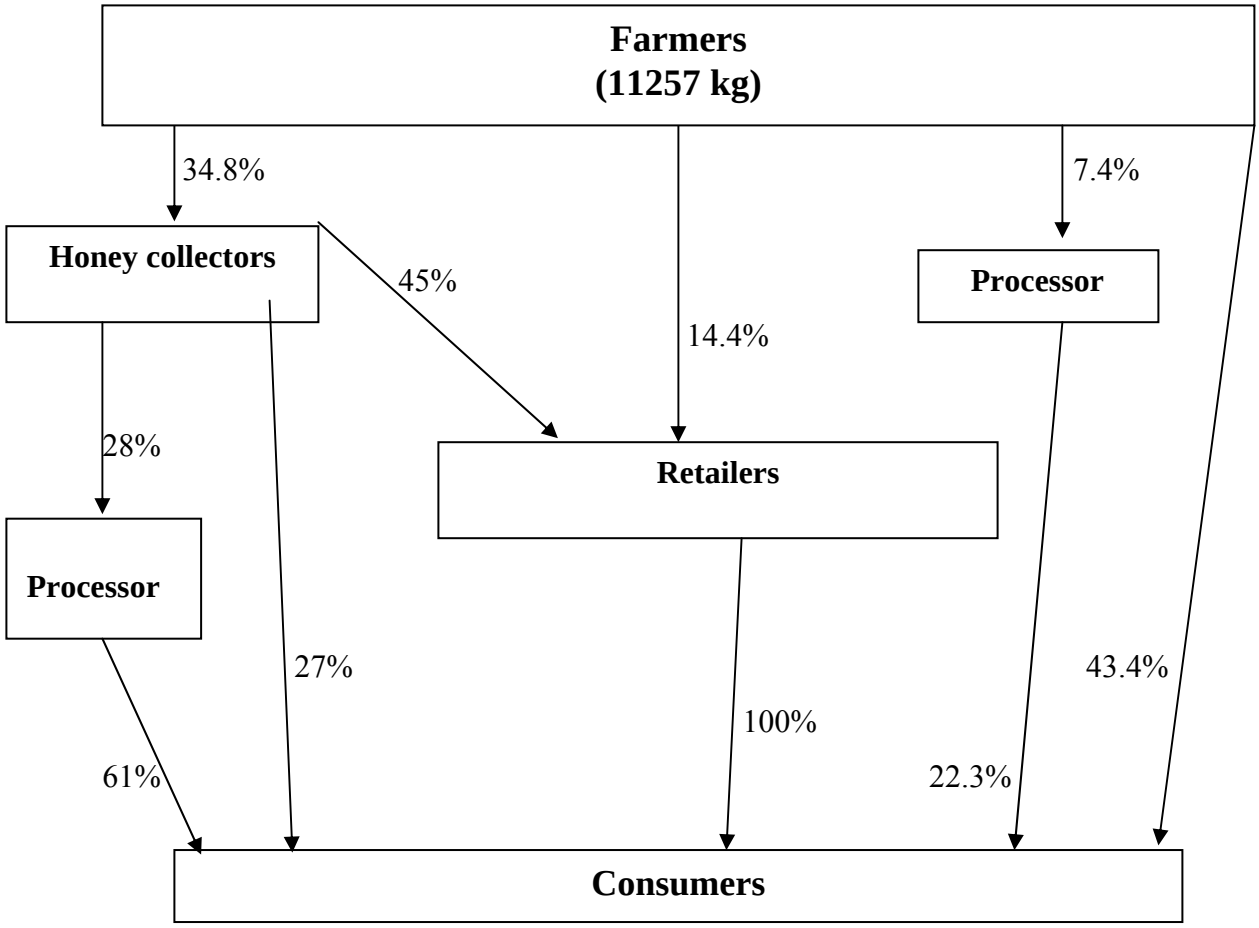


Figure 1 Honey marketing channel

Lines of marketing channels are identified for honey production of the study area. They are very few honey collectors in the study area that employ solely in honey collection activities. They do not carry out trade in honey in large quantities. Channel IV is the dominant in the study area, while channel V is weak and inefficient. The honey collectors procure a significant amount of honey and store it with inappropriate storage materials and they stay for consumers to come to buy the honey, rather than supplying to the nearby markets. Channel II and VI are found to be at an initial stage and it is hopped that this will become stronger in due course of time. This optimism stems from the fact that a private company, which is recently launched at the Zonal city of the study district (in Adigrat) will be an opportunity to create a secure and consistent market in the times to come. According to the respondents, this private enterprise purchased 7.4% of the honey produce in 2006/07 production year directly from the farmers at reasonable price to test the efficiency of its processing plant. Generally, the channel analysis of honey marketing of the study area is found to be a very short route.

**Measure of market concentration ratio**

The concentration ratio is expressed in terms of $CR_X$ which stands for the percentage of the market sector controlled by the biggest X firms. Four firms ($CR_4$) concentration ration is the most typical concentration ratio for judging the market structure (Kohls & Uhl, 1985). A $CR_4$ of over 50% is generally considered a tight oligopoly; CR4 between 25% and 50% is generally considered a lose oligopoly and a $CR_4$ of fewer than 25% is no oligopoly at all. Since the number of traders at each sample market level was few, therefore, the analysis of the degree of market concentration ratio was carried out for all traders. It was measured by the percentage share of volume of honey handled by the largest four traders (Kohls & Uhl, 1985). Here concentration ration for four traders was meant for all honey traders across the study area with largest upper volume in general (Table 20).

As indicated in Table 20, the result of sample market honey traders' concentration ratio CR4 was found to be 35.82 percent. Kohls and Uhl (1985) suggested, as a rule of thumb, a four

largest enterprises concentration ratio of 50 percent or more as an indication of a strongly oligopolistic industry and $CR_4$ between 25% and 50% is generally consider a lose oligopoly and a $CR_4$ of fewer than 25% is no oligopoly at all. Hence, the honey market concentration ratio in the study area was 35.82 percent suggesting a lose oligopoly market type.

Table 20. Honey trader's concentration ratio in the sample market centers

| Number of traders | Cumulative frequency of traders | % of traders | Cumulative % of traders | Quantity purchased in kg | Total quantity purchased in kg | % share of purchase | % cumulative purchase |
|---|---|---|---|---|---|---|---|
| (I) | (II) | (III) | (IV) | (V) | VI=IV*I | (VII) | (VIII) |
| 1 | 1 | 7.143 | 7.143 | 629.95 | 629.95 | 9.89 | 9.89 |
| 1 | 2 | 7.143 | 14.286 | 580.45 | 580.45 | 9.11 | 19 |
| 1 | 3 | 7.143 | 21.429 | 537.75 | 537.75 | 8.44 | 27.44 |
| 1 | 4 | 7.143 | 28.572 | 533.75 | 533.75 | 8.38 | 35.82 |
| 1 | 5 | 7.143 | 35.715 | 471.5 | 471.5 | 7.40 | 43.22 |
| 3 | 8 | 21.429 | 57.144 | 442.4 | 1327.2 | 20.83 | 64.05 |
| 1 | 9 | 7.143 | 64.287 | 431.65 | 431.65 | 6.78 | 70.83 |
| 2 | 11 | 14.295 | 78.582 | 411 | 822 | 12.90 | 83.73 |
| 1 | 12 | 7.143 | 85.725 | 397.5 | 397.5 | 6.24 | 89.97 |
| 1 | 13 | 7.143 | 92.84 | 367.3 | 367.3 | 5.76 | 95.73 |
| 1 | 14 | 7.143 | 100 | 272.6 | 272.6 | 4.27 | 100 |
| | | | | | 6371.3 | 100 | |

Source: own computation, 2008

### 4.3.3. Market conduct

Market conduct refers to the patterns of behavior of firms. This implies analysis of human behavioral patterns that are not readily identifiable, obtainable, or quantifiable (Pomeroy and Trinidad, 1995). There are no agreed upon procedures for analyzing the elements of market conduct. Rather, some points are put to detect unfair price setting practices and the conditions under which such practices prevail. In this study conduct of the honey market is analyzed in terms of the traders' price setting, purchasing and selling strategies.

**Producers' Market Conduct**

Honey is the most important cash income generating commodity in the study district. During the survey, farmers pointed out that supply of honey to the market occurs mainly from October to February. According to the report, about 27 percent, 25 percent and 18 percent of the total yearly sale of honey was made in December, January and February, respectively. The remaining portion of the output 6 percent, 9 percent and 12 percent was sold in September, October and November, respectively. Respondents also reported that there were no significant sales in the months of March-August. During the study, it was observed that, the frequency of honey supplied to the market by most farmers (89%) was twice a year and almost 100 percent of the households' term of sale was on cash basis.

In the study area, farmers organized in terms of PAs. Starting from production up to marketing, every farmer produces and sells on individual basis. This affects their bargaining power during the sale of honey. Accordingly, 97 percent of households reported that, generally, for the last five years, price of honey showed an increasing trend. One of the reasons for the increase in price was mainly the quality of honey produce due to the introduction of improved box beehives according to farmers.

**Traders' Market Conduct**

The survey result indicated that the transactions made on honey marketing of the study area takes place with direct contact between sellers and buyers. There were no observed operational brokers in the honey marketing channel during the survey period. The honey retailers were found to purchase honey either directly from farmers at the local/district market or from honey collectors. The method of price setting is crucial importance in honey trading activity. About 43 percent of the sample traders reported that their purchase price was set by market, about 36 percent of traders set purchase price themselves and 21.4 percent of the traders respond that purchase price was set by negotiation with suppliers. About 64 percent of sample traders set their selling price by the themselves and the rest (or 34 percent) of them respond that selling price was set by market during 2006/07.

### 4.3.4. Performance of the market

Methods employed for the analysis of honey market performance were marketing margins by taking into account associated marketing costs for key marketing channels. Hence, on the consideration of 2006/07 production year, costs and purchase prices of the channel actors, margin at farmers,' retailers,' and honey collectors' level was conducted.

**Cost and profitability analysis of honey production for farmers**

This section of the study focused on activities related to producing honey at farm household. This shows an indication about the performance of honey market. Average costs and sales prices of the producers were used (Table 21).

Table 21. Cost and profitability analysis of honey production for producers

| Costs | Cost/box hive (Birr) per year | Percent |
|---|---|---|
| Feed cost | 27.92 | 5.99 |
| Labor cost | 119.56 | 25.64 |
| pest side cost | 30.93 | 6.63 |
| Transport cost | 12.30 | 2.64 |
| Tax paid | 46.59 | 9.99 |
| Interest payment | 183.25 | 39.29 |
| Cost of equipments (accessory of hive tools) | 45.8 | 9.82 |
| Total cost =A | 466.35 | 100 |
| Average Yield of honey (kg/hive) | 28.66 | |
| Average market price of honey at farm gate (Birr/kg) | 37.35 | |
| Gross sales (birr/hive) =B | 1070.45 | |
| Profit/Loss (Birr/hive) =B-A | 604.1 | |

Source: Own computation, 2008

As Table 21 indicates, cost and profitability analysis of honey production for 2006/07 production year in the study area was encouraging regarding its profitability. This shows that a farmer with 28.66 average production of honey per box beehives with average market price of honey 37.35 Birr at farm gate would generate annual return of ETB 604.1 per box beehives. For this study as indicated in table13 total number of box beehives for the entire sample of respondents was 414, the average holding size being 3.45 hives. If we consider the Yield and the profit that is obtained from a given holding size, a farmer can be generated annual profit of ETB 2084.15 from the beekeeping sector. With regarding to the cost items, interest payment shares the highest (39.29%) followed by labor cost (25.64%). This might be due to the improved hives which farmers' receive on credit basis.

**Cost and profitability analysis of honey production for honey collectors**

Cost and profitability analysis of honey collectors was summarized in Table 21. Average costs and sells prices of honey collectors were under taken in the analysis.

Table 22. Cost and profitability analysis of honey collectors

| Cost items | Cost per kg (Birr) | Percent from total cost |
|---|---|---|
| Honey collectors' purchase price =A | 37.35 | |
| Labor cost | 0.0.5 | 5 |
| Transport cost | 0.13 | 13 |
| Tax paid | 0.15 | 15 |
| Honey container | 0.315 | 31.5 |
| Other costs | 0.355 | 35.5 |
| Total operation cost =B | 1.00 | 100 |
| Total cost =C | 38.35 | |
| Gross sales = D | 40.00 | |
| Profit/Loss ( E)= D-C | 1.65 | |

Source: Own computation, 2008

The result of Table 22 shows that honey collectors of the study area during the survey period were obtained a profit of ETB 1.65 per kg of honey. This indicates that the performance of marketing of honey collectors for the specified year 2006/07 was showing positive figure even though the amount of profit was a small number per kg basis. The table also shows that other costs like personal costs of the honey collectors during the operation takes the largest proportion of overall costs (35.5%) followed by honey containers (31.5%).

**Cost and profitability analysis of honey production for retailers**

Cost and profitability analysis of honey retailers was summarized in Table 23. Average costs and sales prices of retailers were under taken in the operation.

Table 23. Cost and profitability analysis of honey retailers

| Costs | Cost per kg (Birr) | Percent |
|---|---|---|
| Retailers' purchase price =A | 40.00 | |
| Labor cost | 0.09 | 7.36 |
| Transport cost | 0.18 | 14.75 |
| Tax paid | 0.16 | 13.11 |
| Rent of retail shop | 0.7 | 57.38 |
| other cost | 0.09 | 7.4 |
| Total operation cost =B | 1.22 | 100 |
| Total cost (C) =A+B | 41.22 | |
| Average retail price Birr/kg =D | 45 | |
| Traders profit/loss E=D-C | 3.78 | |

Source: Own computation

With regard to the cost and profitability analysis of the sample honey retailer's found in the sample markets, as the Table 23 clearly shows retailers were found to be profitable. This indicates that a retailer can obtain a profit of ETB 3.78 per kg at retail level which was higher by 2.13 than Birr profit of honey collectors. Concerning cost of operation of retailers', rent for retail shop is the highest (57.38%) followed by transport cost (14.75%).

**Marketing Margins**

Marketing margins are the difference between prices at two market levels. The term market margin is most commonly used to refer to the difference between producer prices of an equivalent quantity and quality of a commodity. However, it may also describe price differences between other points in the marketing chain, for example, between producer and wholesale, or wholesale and retail, prices (Spencer, 1971). Therefore, for this section of the study by considering the average sales prices of different participants in the honey market channel (farmers, honey collectors and retailer); Table 24 summarized the different indicators of marketing margins for the honey market channel.

Table 24. Average price of honey at different market levels, 2006/07

| Marketing channel participants | Price (Birr/kg) | Marketing cost | Gross profit (Birr/kg) | Gross marketing margin |
|---|---|---|---|---|
| Farmer | 37.35 | 16.27 | 21.08 | 83% |
| Honey collectors | 40 | 1.00 | 1.65 | 5.89% |
| Retailers | 45 | 1.22 | 3.78 | 11.11% |

Source: Own computation

TGMM (Complete distribution channel) 17%

GMM (honey collectors) = 5.89%

GMM (retailers) = 11.11%

$GMM_P$ (producers participation) 100% -17% =83%

Table 24 reveals that 17% of total gross marketing margin was added to honey price when it reaches the final consumer at the regional capital of Mekelle. Out of the total gross marketing margin 5.89% was gross margin of honey collectors, while 11.11% was that of retailers.

### 4.4. Determinants of Honey Market Supply

Honey is produced mainly for market and is one of the most important cash commodities for Atsbi Wemberta district farmers. Data collected from sampled respondents indicated that 95 percent of the total honey produced in 2006/07 production year was supplied to the market. According to the report all the sample households were potential suppliers of the commodity to market during the survey period. Several variables are hypothesized to determine the market supply by sampled honey produced farmers.

Before running the OLS regression model, all the hypothesized explanatory variables were checked for the existence of multi-co linearity and heteroscedasticity problem. The study used Variance inflation factor to investigate the degree of multi-co linearity among continuous explanatory variables and contingency coefficient among discrete (dummy) variables. A statistical package known as SPSS12 was employed to compute the VIF and CC values. The results for all VIF values were ranging between 1.123 and 8.640. Likewise, the values of CC were ranging between 0.039 and 0.101. Hence, multi-collinearity was not a serious problem both among the continuous and discrete variables. For details (Appendix Table1 and 2).

In this study heteroscedasticity was tested for all variables by running heteroscedastic regression using an Econometric soft ware (LIMDEP). There was no serious problem of heteroscedasticity in the model. And hence all the explanatory variables were included for the model analysis of determinants of market supply of honey. The overall goodness of fit of the regression model is measured by the coefficient of determination ($R^2$). It tells what proportion of the variation in the dependent variable, or regress and, is explained by the explanatory variable. $R^2$ lies between 0 and 1, the closer it is to 1, and the better is the fit. Hence, The overall model goodness of fit represented by model count R-square is very good and over 98 percent of the household were correctly predicted out of the 120 households heads.

### 4.4.1. Econometric results of the OLS model

Ten explanatory variables were hypothesized to determine the household level marketable supply of honey. Among the hypothesized 10 variables namely sex of the household, age of the household, education level of household, experience in beekeeping, extension access, quantity honey of produce, price of honey in 1999 E.C., access to credit, distance to the nearest market and market information, only three variables were found to be significantly affecting the household marketable supply of honey at household level (Table 25). Quantity of honey produce, price of honey in 1999 E.C., education level of the household head influenced positively the marketable supply of honey by household as predictable. The remaining 7 variables (age, sex, extension access, and experience in beekeeping, access to credit, distance to the nearest market and access to market information) were found to have no significant effect on honey market supply.

**Education level of the beekeeping household (EDLHH)**: Education has a positive effect on honey sale quantity per household per year. It is statistically significance at 10% significance level. The model output verifies that one additional formal year education level leads to the beekeeping household to increase yearly honey production by 1.962 Kilograms. The positive and significant relationship indicates that education improves the beekeeping household ability to acquire new idea production related and market information, which in turn improves productivity and thereby increase marketable supply of honey.

**Quantity of honey produced (QTYHP)**: As hypothesized the multiple linear regression output variable was significantly at 1% significant level, a positive coefficient implies that an increase in quantity of honey produced increase marketable supply of farmers. It indicates that households who produce more quantity of honey had also supplied more to the market. The result also shows that due to insignificant consumption of honey at household level, a unit

Table 25. OLS results of determinants of honey market supply

| Variable | Coeff. | Std.Err | t-ratio | P-value |
|---|---|---|---|---|
| Constant | -23.666 | 10.601 | -2.232 | 0.028** |
| AGE | -0.014 | 0.053 | -0.264 | 0.784 |
| SEX | 0.078 | 2.642 | 0.030 | 0.976 |
| EDLHH | 1.962 | 0.900 | 2.180 | 0.031** |
| EXP | 0.046 | 0.130 | 0.354 | 0.724 |
| EXACC | -0.975 | 2.039 | -0.478 | 0.633 |
| QTYHP | 1.006 | 0.031 | 32.452 | 0000*** |
| PRICE99 | 0.550 | 0.225 | 2.444 | 0.016** |
| ACC | 0.089 | 2.799 | 0.032 | 0.975 |
| DSMKT | -0.025 | 0.199 | -0.126 | 0.877 |
| ACCMIF | 2.557 | 2.114 | 1.210 | 0.238 |

Dependent variable=quantity supplied, N=120, R-Squared=0.987, Adjusted R-squared=0.986***, ** and * shows the values statistically significant at 1%, 5% and 10% respectively

increase in the quantity of honey produced per box beehives, causes a 1.006 kilograms increase in the amount of market supply. Similarly, previous studies conducted by Wolday (1994), Wolelaw (2005), Rehima (2006), Kindie (2007) and Bosena (2008), found that the amount of grain, rice, red pepper, sesame and cotton respectively, produced by household affected marketable supply of each of the commodities significantly and positively.

**Price of honey in 1999 E.C**.: The coefficient of price of honey in 1999E.C. which shows a positive relation to the quantity of honey sold or supplied to market. Producers checked the price of honey for their best benefit and this directs to the determinant to be the significance at 5% level. The positive and significant relationship between the variables indicates that as the price of honey at market rises, the quantity of honey sold at the market also rises, which in turn increases quantity of honey sold per household per year. The coefficient of the variable also confirms that a unit price increase in the honey market directs to the beekeeping household to raise yearly honey sales by 0.55 kilograms per box beehives. The study of Wolelaw (2005), on determinants marketable supply of rice found a significant positive relationship between rice sold and current price.

On the other hand, age of the household, sex, experience in beekeeping, extension access, access to credit, distance to the nearest market and access to market information did not significantly influenced the quantity of honey sold in the study area as they expected.

# 5. CONCLUSION AND RECOMMENDATIONS

## 5.1. Conclusion

The study was conduct with the objective of understanding the marketing system of apiculture production in Atsbi Wemberta district of Tigray region with specific focus on honey. Honey has been identified in the district as a major cash income generating commodity. Honey in the district is important market oriented commodity. Atsbi Wemberta district has high potential in honey production. There are about 18,567 honey bee colonies in the district out of which 5740 are improved box beehives. The price of one honeybee colony is Birr 550 in the study area, pure and crude honey costs on average Birr 37.35 and 25 per kg respectively. The analysis was made with the help of descriptive and econometric model using SPSS and LIMDEP econometric software.

The data were generated by individual interview using pre- tested questionnaires and a rapid market appraisal technique. This was supplemented by secondary data collected from different published and unpublished sources. A total of 120 beekeeper farmer respondent's (115 males and 5 females) were selected randomly from a list of 1670 beekeepers from 3 PAs in the district. Fourteen honey traders from three towns (Mekelle, Wukro and Atsbi) were also interviewed. The result of descriptive analysis of farmers' data point out that, the average honeybee colony holding size per household in the study area during the survey year were about 3.5 and the average honey productivity per box beehives was 28.66kg.

Majority (79%) of the respondents had about 3-8 years of beekeeping experience and the average years of experience acquired for the entire sample was about 7 years. The result also showed that total production of honey by respondents' during the survey period was 11,867 kg and out of this total production, 11,257 kg or about 95 percent of the production were marketed through different marketing channels that were being identified during the survey period with an average price of Birr 37.35 per kg.

The survey result indicated that total gross income generated by respondents from annual sale of honey was about Birr 420, 449 and the mean income of the sampled households was estimated at Birr 3503.74 at the survey period. The district Office of Agriculture and Rural Development is the center of extension providing institution with three development agents assigned in each PA to support farmers. About 84 percent of respondents had access of extension contact with different frequencies. The remaining percentage (16%) of respondents reported no extension contact.

There are a number of highlighted problems that impede the further development of honey production in the study area. About 75 percent of the respondents reported that the most serious problems they faced was feed shortage (drought) followed by absconding of honeybee. Disease, pests, lack of beekeeping equipments and death of colony problems were also among the constraints which contribute for reduction of the production. The increased honey production during the harvest period was found to coincide with periods of low price. As a result 28 percent of the sampled households indicated that there were no ready markets to attract their produce. The other problem related to production and marketing problems of honey was the poor quality of the product due to improper handling which was recording about 65 percent of honey traders.

Quantity of honey supplied to the market passed through different marketing agents from farmers to consumers. About 43.4% (4876 kg), 34.8% (3921 kg), 14.4% (1622 kg) and 7.4% (838 kg) of the total honey marketed were purchased by consumers directly from producers, honey collectors, retailers and processors, respectively in 2006/07. The computed four-firm concentration ratio (CR4), which is the share of the largest four traders in the total yearly volume of honey purchased, was 35.8 percent indicated a lose oligopolistic market structure. Starting from production up to marketing, every farmer produce and sold on individual basis. This affects their bargaining power during the sale of honey. About 97 percent of households reported that, generally, for the last five years price of honey in the study area showed increasing trend. The survey result also indicated that there were no observed operational

brokers in the honey marketing channel during the survey period. The honey retailers were found to purchase honey either directly from farmers at the local/district market or from honey collectors. The method of price setting is crucially important in honey trading activity, about 43 percent of the sample traders reported that their purchase price was set by market, and about 36 percent of traders set purchase price themselves, and 21.4 percent of the traders respond that purchase price was set by negotiation with suppliers.

The results of the marketing costs, profits and margin analysis indicated that producers incurred the highest production cost followed by retailers. During production interest payment takes the largest proportion which was 39.29 percent followed by labor cost which accounts about 26 percent of the total production costs. With regard to the marketing cost of honey retailers, without the purchase price of honey, rent for retail shop took the largest proportion. This was about 58 percent of all marketing costs. Gross profit analysis for 2006/07 production year showed that average gross profit for farmers per box beehives was estimated at Birr 604 and honey collectors gross profit was Birr 1.65 per kg, while that of retailers was about Birr 4 per kg on the average. About 17 percent of total gross marketing margin was added to honey price when it reaches to the final consumers at the regional capital of Mekelle. Out of the total gross marketing margin about 6% was gross margin of honey collectors, while 11% was that of retailers. The study pointed out that all marketing participants of the commodity operated at profit. This indicated that all the marketing agents were advantageous through the channel.

Estimation of determinants of marketable supply of honey with the help of Robust OLS regression analysis was employed with ten hypothesized variables. The result of OLS regression model analysis pointed out that education level of the household, size of quantity of honey output and market price of honey in 1999 E.C. were found to be significant with the expected sings. The model result predicts that one additional formal year education level leads to the beekeeper household to increase yearly honey output by about 1.96 kg.

## 5.2. Recommendations

Possible recommendations that could be given on the basis of the study so as to be considered in the future intervention strategies which are amid at the promotion of honey production and marketing of the study area were as follows:

1. The result of OLS regression model analysis has shown that the most important variables influencing the quantity of honey supplied in the study area during the survey period were education level of the household head, size of honey output and price of honey in 1999 E.C As it was indicated from the model analysis pointed out that honey marketing supply was positively and significantly influenced by formal education level of the household head beekeeper. This result verifies that education develops the willingness of the beekeeper household to allow new technology and information which in turn widens their readiness to produce more and thereby raises honey marketable supply. Accordingly, the district ARD and other apiculture development partners should give weight practical supported beekeeping training in which focused on pre and post harvest management of honey production and marketing.

2. The OLS regression model output find out that size of honey produced by individual households was found to influence the quantity supply significant positively during the survey time. The positive significant effects of the variable propose that by improving productivity of the household, sale volume of the commodity can be expanded. This believed to happen due to the introduction of improved box beehives. Therefore, increasing the distribution of improved box hives accompanied by safety protective materials for farmers of the district would bring additional marketable supply of the produce.

3. The OLS econometric model result did not happen with significant influence on market information as hypothesized, the problems related with market information lead to low-priced. Hence, market information is an important component for improving production system of the sector. The availability of timely and precise market information increases producers'

bargaining capacity to negotiate with buyers of their produce. In order to obtain this advantage there is a need to improve extension system which focused on market extension linkage farmers with markets is necessary to ensure a reliable market outlet for beekeepers of the study area. This should be further strengthening by marketing organizations such as cooperatives and other honey marketing institutions to involve in communicating the honey produces and the ultimate consumers so that farmers can sell their produce at reasonable prices.

4. Feed shortage (drought) is one of the major problems identified and prioritized by farmers in the study area. To reduce this problem, it is essential to integrate beekeeping activities with water harvesting to secure their livelihood. The research organization should select moisture stress tolerant potential bee forage suitable to the area and promote them widely in collaboration with bee keeping extension, NGOs, and the private sectors. Similarly, the existing indigenous bee forages such as "gribiya" (Hypostus ariculata) and "tebebe" (Basium Clandiforbium) etc, which flower even in the summer season should be promoted and also grown in area enclosures. The survey result indicated that the overall honey marketing system of the study area during the survey period was found to be traditional and under developed. Thus government actions are required to license and inspect computing honey product traders to ensure achievements of minimum hygiene and quality standards in order to facilitate the honey production and marketing process.

5. Beekeeping is culturally defined as a men's occupation. This was also indicated by the result of descriptive analysis therefore, women should be encouraged to participate and receive training and intuitional support in the form of credit in improved beekeeping methods. Major problems of beekeeping identified and prioritized in the study area were feed shortage (drought), pests and disease of honey bees, lack of beekeeping materials, death of colony, marketing problems and lack adequate beekeeping management skill. Therefore, providing the necessary exposure and skills, and institutional support in the form of credit, training, experience in improved beekeeping methods and marketing linkages need to be addressed simultaneously. All the problems faced by beekeepers cannot be addressed by a single

organization, various actors: including research, extension, decision makers, input suppliers and credit agencies need to be collaborate in search of appropriate solutions and implement them.

# 6. REFERENCES


Abonesh. T. (2005). Imperfect competition in agricultural markets: Evidence from Ethiopia. Journal of Development Economics 76 (2), 405-425.

Abbott, J.C., 1958. Marketing problems and improvements program. Food and Agricultural Organization of United Natios. 1:5-41.

Abbott, C., and Mekeham, p. (1990). Agricultural economics and marketing in the Tropics. Second Edition. Longmam Group, Limited. Harlow, England.

Acharya, S.S. and N.L. Agarwal, 1999.Agricultural Marketing in India. Oxford and Publishing Co. Pvt. Ltd., New Delhi. 370p**.**

Adjare,S.O.1990.Beekeeping in Africa. Agricultural Services Bulletin 68/6. Food and Agriculture Organization of the United Nations Rome1990 .http://www.fao.org/docrep//to104e00.htm.

Atsbi Wenberta district Agriculture and Rural Development Office (2008).

Ayalew Kassaye, 2001. Production of beekeeping in the rural sector of Ethiopia. In proceeding of the third Ethiopian Beekeepers Association.(EBA), pp 55-58.

Bain, J.S. (1968).The Profit rate as a measure of monopoly power. Quarterly Journal of Economics 55:271-293.

Bain, J.S. (1968).Industrial Organization. Second Edition, John Wiley and Sons, New York.

Bosena Tegegne, 2008. Cotton market chain analysis: the case of Metema Woreda, North Gondar Zone, Amhara National Regional State. An MSc Thesis Presented to School of Graduate Studies of Haramaya University. 123p.

Branson, R.E. and D.G. Norvell (1983). Introduction to Agricultural Marketing, M.C.Grow Hill Book Company.

Bressler, RG. And R.A. King. 1970. Markets, prices and inter regional trade.Ny, NY, USA: John Wiley and Sons.
Cleaver, K.M. and A.S. Gotz, 1994. Reversing the spiral: The population, agricultural and environment nexus in sub-Saharan Africa. The World Bank, Washington, D.C. 43p.
CIAT (Centro International de Agricultureal Tropical). 2004. Increasing the Competitiveness of market chains of smallholders producers. Manual,3: Teritorial Approcch to Rural Agro Enterprise Development Project.

CSA, 2006. Statistical Abstract 2005. Central Statistical Agency: Addis Ababa, Ethiopia.

Devine, P.S., N.Lee, R.M. JONES and W.J.Tyson. 1984. An introduction to industrial Organization. 5th Edition. London, UK: George Allen and Unwin.

EEA (2004). Industrialization and industrial policy in Ethiopia: Report on the Ethiopian Economy, Vol. III 2003/04. Ethiopian Economic Association/Ethiopian Economic policy Research Institute, Addis Ababa, Ethiopia.

EEPD (Ethiopian Export Promotion Development), 2006. Export of honey and beeswax. Draft report. EEPD, Ministry of Trade and Industry, Addis Ababa, Ethiopia.

Edessa Negera, 2005.Survey of honey production system in West Shewa Zone. In proceeding of the 4th Ethiopian Beekeepers Association (EMA).

Eleni Gebremedhin, 2001. Market institutions, transaction costs, and social capital in the Ethiopian grain market. Research Report No124. International policy Research Institute. USA. 93p.

Fadare S.O. 2003. Bees for Development. Journal of Economics 66:132-287.

FAO (Food and Agriculture Organization), 1997. Agriculture and food marketing management. Rome, Italy.

FAO (Food and Agricultural Organization), 1999. Market Infrastructure Planning: A guideline for decision-makers, FAO, 141, Rome. 34p.

FAO STAT 2005. Statistical Data base- Livestock. Available from: htt://faostat.fao.org/default.aspx[Accessed on 21 October r 2007].

FAO (Westlake).2005. Addressing Marketing and Processing Constraints that Inhabit Agri food Exports: A guide for Policy Analysis's and planners.Agricultural Service Bulletin 160.
.

Gebre-Meskel Desalegne, T.S Jayne. And J.D.Shaffers. 1998. Market structure, Conduct, and Performance: Constraints on performance of Ethiopian Grain Marks.Working paper No.8, Grain market Research Project, MEDAC, Addis Ababa

Girma Deffar, 1998. Non-Wood Forest Production in Ethiopia. Addis Ababa, Ethiopia. Available from: ftp://ftp. Fao. Org/decrep/fao/003/X6690E00.pdf. [Accessed on 25 Sptember 2007 ]

Gizachew Getaneh, 2005. Dairy Marketing Patterns and Efficiency: The case of Ada' Liben District, eastern Oromia. M.Sc Thesis presented to Alemaya University, Ethiopia

Goetz, S., and M, T., Weber, 1986. Fundamentals of price analysis in developing countries' food system: a training manual to accompany the microcomputer software program "MSTAT" Working paper No 29. MSU. International Development papers Michigan State University, East Lansing, Michigan, USA. 148p.

Greene, W.H.2003. Econometric Analysis. Fifth Edition, Pretice Hall International, Inc. New York.

Guajirati, Domodar, 2003. Basic of Econometrics, 4th edition. McGraw hill Company, IN United States Military Academy, West point

Hartmann I, 2004. The management of resources and marginalization in beekeeping societies of South West Ethiopia. Paper submitted to the conference: Bridge Scales and Episte mologies, Alexandria.p.1.

Holloway, G., Charles Nicholso, C., and Delgado, C., 1999. Agro-industrialization through Institutional Innovation: Transactions Costs, Cooperatives and Milk- Market Development in Ethiopian Highlands. Discussion paper No.35.

Holloway, G., and S. Ehui, 2002. Export marketing participation among Smallholder livestock producers: A collection of studies employing Gibbs sampling and data from Ethiopian highlands. Socio-economies and policy Research Working paper 48. ILRI, Nairobi, Kenya. 85p.

ITC. 1986. Honey: a study of major markets. International Trade Centre, UNCTAD/GATT, Geneva.

ITC. 1996. Markets for selected medicinal plants and their derivatives. International Trade Centre/UNCTAD/GATT, Geneva

IPMS (Improving Productivity and Marketing Success), 2005.Atsbi Wonberta District Pilot Learning Site Diagnosis and Program Desing.

Jones, O.W. 1972. Marketing staple Foods in Tropical Africa. London, Cornell University Press.60p.Teff.

Kindei Aysheshm, 2007. Sesame market chain analysis: the case of Metema *Woreda*, North Gondar Zone, Amhara National Regional State. An MSc Thesis Presented to School of Graduate Studies of Haramaya University. 123p.

Kohls, Richald L.and Joseph N. Uhl. 1985. Marketing of Agricultural Products. 6th edition. Macmillan Publishing Company, New York.

Koler, P. G. Amsrog, 2003. Principle of marketing 10th Edition, Hall of India Pvt. Ltd., New Delhi. 5-12p.

Kotler, P., 2003 marketing management. Eleven Edition. Pearson Eduction Inc, USA.

Larson, A.L., 1957.Agricultural marketing. Prentice- Hall. New York, USA.

Magrath, p. 1992. Methodologies for studying Agricultural Marketing in Developing countries UK.

Malhaotra N, 1996. The use of structure conduct and performance of the market to measure the marketing efficiency (A theoretical frame work) MEB (i); 53-59.

Malik, D.S.N. Sigh and K.N. Rai, 1993. Marketed and marketable Surplus of Wheat and Paddy crops in Kuruk Sheta District of Harchyana, India. Journal of Agricultural Marketing, Vol. 7, N0.1, pp.59-67.

Mazula, R., undated. 2006. Commodity Chain Approach and Deal Structuring: An Agri-Business Case Study in Zimbabwe Progress Fund. PP.73-78., Zimbabwe. [Online] Available from: http://www.zoic.co.zw/documents.pdf. [Accessed on 10 Sptember 2008].

Mendaoza, G.*et al.*1982. Canales de Comerrcializaciony precios delapalta. Ministerio de Agricultura-IICA, San Joes, Costa Rica.

Mendoza, G., 1995. A primer on marketing channels and margins. P257-275.In G.J. Scott (ends). Prices, Products, and people; Analyzing Agricultural markets in Developing Countries. Lynne Rienner Publishers, Boulder, London.

Mendaza, M.S. and Rose-grant (1995); pricing behavior in Philippine Corn market: Implication for food marketing efficiency, IFPRI Research report1.

Ministry of Trade and industry, Annual External Trade Statistics, 1984-1994. Ministry of Trade and Industry, Addis Ababa, Ethiopia.

Mudiantolo. 1990. The use of Structure, Conduct and Performance of the market to measure the marketing efficiency (A, theoretical framework). MEB 2(1):53-59.

Omta, O., Trienekens, J. and Beers, G. 2001. The Knowledge domain of chain and network Science, Journal on chain and Network service, Vol.1, Issue 2, Wagenigen University and Research Center, The Netherlands.

Organization for Economic Cooperation and Development (OECD). 1982. Price formation and the performance of agro food systems. OECD, Paris, France.

Pomery, R.S. 1989. The economics of production marketing in Small scale agricultural products: Matalom, Leyte, Phill ppines. ICLARM?

Pomeroy, R.S. and A.C. Trinidad, 1995. Industrial Organization and market analysis: P217-238. In: G.J. Scott (eds). Prices, products, and people: Analyzing Agricultural Markets in Developing Countries. Lynner Reinner publishers, Boulder, London.

Purcel, 1979. Market structure and monopoly power. American Economy Review 39:883-97.

Rehima Musema, 2006. Analysis of red pepper Marketing: The case of Alaba and Silitie in SNNPRSof Ethiopia. A M.Sc. Thesis presented to School of Graduate Studies of Haramaya University. 96-95p.

Renakumar, R., 2001. Costs and Margins in coconut marketing: Some evidence from Kerala, Indian J. Agric Economics 56 (4) 668-680.

Richarrd L.Kols. 1961. Marketing of Agricultural Products.2nd edition. Macmillan Publishing Company, New York.

Scarborough, Vanessa and Kydd, 1992. Economic Analysis of Agricultural market: A Manual Marketing Series 5, Chatham. UK: Natural Resource Institute. 172p.

SGS (School of Graduate Studies), 2004. A manual on Research Proposal and Thesis/Dissertation writing for Graduate students of Alemaya University.

Scherer, F.M. 1980. Industrial market Structure and Economics Performance. 2nd Edition. Chicago, IL, USA: Rand Mealally College Publishing Company.

Smith, I.R. 1985.The economics of the milkfish fry and fingerling industry of the Philippines. ICLARM Technical Reports 1. International Center for Living Aquatic Resources Management, Manila and Aquaculture Development (ICLARM), Southeast Asian Fisheries Development Center, Iloilo, Philippines.

Tomek, W.G. and K.L. Robinson, 1985. Agricultural product prices, 2nd ed. Ithaca, N. Y. USA: Comell University press.

Tomek, WG, and K.L., Robinson, 1990. Agricultural product prices. Third Edition. Comel University Press. Ithaca and London. 240p.

Trotter, B. W., 1992. Applying price analysis to marketing systems: Methods and examples from the Indonesian rice market. Marketing series3. Natural Resource Institute. Chatham. United Kingdom.

Tshiunza, M., L. Lemchi, J., Tenkonano, A., 2000. Determinants of Market production of Cooking Banana in Nigeria. African crop Science. Journal 9(3): 537-547.

Wolday Amaha (1994). 'Food and Grain Marketing Development in Ethiopia after Reform of 1990,' a study of Aleba Siraro district, Koster Publisher. Berlin.

Wolelaw, S., 2005. Factors Determining Supply of Rice: A Study in Fogera District of Ethiopia. A MSc. Thesis Presented to the School of Graduate Studies of Alemaya University.90p.

# 7. APPENDICES

**A**ppendix Table 1. Multicollinerity test with VIF

| Variable | Tolerance | VIF |
|---|---|---|
| AGE | 0.685 | 1.461 |
| EDLHH | 0.890 | 1.123 |
| EXP | 0.672 | 1.489 |
| QTYHP | 0.116 | 8.627 |
| PRICE99 | 0.824 | 1.213 |
| DNMKT | 0.156 | 7.823 |

Appendix Table2**.** Contingency Coefficient

| | ACC | ACCMIF | EXACC | SEX |
|---|---|---|---|---|
| ACC | 1 | | | |
| ACCMIF | 0.070 | 1 | | |
| EXACC | 0.050 | 0.101 | 1 | |
| SEX | 0.039 | 0.047 | 0.056 | 1 |

Appendix Table 3. Average production of honey per box beehives and total production at the district level for the last four years

| Years | Average production of honey per box beehives in kg | | Total production of honey in quintal | |
|---|---|---|---|---|
| | From improved box beehives | From traditional box beehives | From improved box beehives | From traditional box beehives |
| 1999 | 35.75 | 12.77 | 1440.30 | 1029.10 |
| 1998 | 20.16 | 7.00 | 396.00 | 290.00 |
| 1197 | 22.67 | 7.00 | 394.97 | 190.40 |
| 1196 | 18.69 | 7.00 | 107.83 | 20.79 |

Source: ARDO of the District, 2008

Appendix Table 4.Quarterly Average retail price of honey (Birr/Kg) in different market centers found in the region from 5/2/2006 to 6/10/2008

| Commodity | Market | Unit | Qtr2 2006 | Qtr3 2006 | Qtr4 2006 | Qtr1 2007 | Qtr2 2007 | Qtr3 2007 | Qtr4 2007 | Qtr1 2008 | Qtr2 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Honey red (tradition) | Abi-adi | KGS | 13.88 | 14.44 | 14.08 | 14.25 | 14.49 | 15.50 | 15.05 | 14.69 | 16.20 |
| | Adigrat | KGS | 14.09 | 14.32 | 15.92 | 16.72 | 17.94 | 17.59 | 18.41 | 19.62 | 21.69 |
| | Alamata | KGS | 14.91 | 15.76 | 16.47 | 16.84 | 18.32 | 20.33 | 19.62 | 20.54 | 23.08 |
| | Atbi | KGS | - | - | - | - | 14.47 | 17.00 | 16.78 | 18.23 | 19.70 |
| | Axum | KGS | 15.12 | 13.86 | 14.21 | 13.66 | 14.58 | 14.12 | 16.02 | 17.88 | 17.63 |
| | Endasilasie | KGS | 18.18 | 18.95 | 18.08 | 19.44 | 19.52 | 19.78 | 20.05 | 21.36 | 23.22 |
| | Hawzen | KGS | 16.36 | 16.37 | 15.62 | 15.56 | 15.52 | 15.57 | 15.15 | 16.44 | 19.95 |
| | Humera | KGS | 19.53 | 19.22 | 18.58 | 18.82 | 19.74 | 21.97 | 22.65 | 22.23 | 24.72 |
| | Maichew | KGS | 14.89 | 17.42 | 17.60 | 16.94 | 17.36 | 18.42 | 18.12 | 18.62 | 18.62 |
| | Mekelle | KGS | 14.83 | 15.86 | 15.52 | 16.98 | 18.42 | 18.89 | 18.38 | 19.62 | 20.80 |
| | Raya-Azebo | KGS | 17.94 | 15.76 | 17.75 | 19.50 | 22.26 | - | - | - | - |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sheraro | KGS | 14.55 | 15.99 | 15.43 | 16.89 | 15.68 | 17.11 | 18.12 | 18.60 | 19.00 |
| | Wukro | KGS | | | | 16.50 | 16.48 | 17.96 | 18.39 | 19.04 | 21.75 |
| Honey (white traditional) | Abi-adi | KGS | 28.69 | 27.68 | 26.83 | 26.45 | 27.78 | 28.90 | 27.87 | 25.92 | 29.47 |
| | Adigrat | KGS | 36.36 | 39.13 | 38.64 | 40.00 | 40.34 | 38.57 | 37.65 | 39.25 | 37.91 |
| | Alamata | KGS | 26.50 | 27.87 | 28.16 | 30.20 | 29.52 | 33.54 | 32.29 | 36.77 | 39.63 |
| | Atsbi | - | - | - | - | - | 35.47 | 30.38 | 30.25 | 32.32 | 32.97 |
| | Axum | KGS | 25.33 | 26.49 | 25.92 | 26.15 | 27.08 | 26.99 | 28.26 | 28.88 | 29.73 |
| | Endasilasie | KGS | 23.00 | 25.25 | 23.22 | 24.98 | 25.57 | 26.55 | 26.82 | 27.24 | 27.87 |
| | Hawzen | KGS | 27.02 | 25.67 | 27.55 | 28.93 | 29.68 | 28.94 | 29.29 | 30.30 | 32.90 |
| | Humera | KGS | 25.00 | 25.09 | 25.28 | 25.72 | 26.15 | 32.33 | 30.56 | 30.63 | 30.30 |
| | Maichew | KGS | 27.76 | 26.73 | 26.21 | 28.10 | 29.55 | 30.50 | 30.67 | 32.19 | 32.87 |
| | Mekelle | KGS | 33.59 | 39.78 | 35.94 | 38.29 | 40.75 | 42.32 | 40.45 | 44.71 | 46.52 |
| | Raya-azebo | KGS | - | - | - | - | - | 27.27 | 27.58 | 30.38 | 32.84 |
| | Sheraro | KGS | 17.41 | 20.85 | 19.89 | 22.55 | 23.48 | 22.49 | 23.25 | 24.38 | 25.80 |
| | Wukro | KGS | - | - | - | 33.00 | 30.74 | 36.43 | 34.55 | 36.62 | 40.90 |
| Honey (white ) | Abi-adi | KGS | 37.95 | 35.16 | - | 25.50 | - | - | - | - | - |
| | Adigrat | KGS | 30.80 | - | 34.00 | 30.12 | 30.00 | 30.00 | 30.22 | 31.40 | 32.00 |
| | Alamata | KGS | - | - | - | - | - | - | - | 31.20 | - |
| | Atsbi | KGS | - | - | - | - | 39.07 | 36.04 | 34.84 | 38.60 | 4060 |
| | Axum | KGS | 24.58 | 26.03 | 25.80 | 26.03 | 26.64 | 26.75 | 28.25 | 29.54 | 30.12 |
| | Endasilasie | KGS | 27.19 | 28.35 | 26.42 | 28.41 | 29.16 | 30.40 | 30.29 | 30.80 | 32.60 |
| | Hawzen | KGS | 31.22 | 31.22 | 31.09 | 31.50 | - | - | - | - | - |
| | Humera | KGS | - | - | - | - | - | - | - | 38.00 | - |
| | Mekelle | KGS | 46.41 | 50.00 | 47.08 | 48.62 | 51.24 | 51.18 | 49.62 | 51.10 | 53.26 |
| | Raya-azebo | KGS | - | - | - | - | - | - | 30.15 | - | - |
| | Sheraro | KGS | 18.80 | | | | | | | | |
| | Wukro | KGS | | | | 37.50 | 38.74 | 38.71 | 39.55 | 39.92 | 43.90 |
| Honey (Yellow, | Abi-adi | KGS | 22.05 | 21.32 | 21.76 | 21.06 | 22.26 | 22.33 | 20.49 | 20.67 | 24.29 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| traditional) | | | | | | | | | | | |
| | Adigrat | KGS | 21.60 | 25.45 | 23.29 | 24.95 | 26.69 | 26.63 | 24.42 | 26.12 | 29.03 |
| | Alamata | KGS | 19.63 | 20.1. | 20.24 | 20.63 | 23.05 | 25.55 | 23.33 | 24.93 | 28.13 |
| | Atsbi | KGS | - | - | - | - | 30.47 | 27.69 | 25.55 | 27.37 | 26.60 |
| | Axum | KGS | 20.51 | 22.47 | 22.04 | 21.47 | 23.16 | 23.62 | 22.31 | 23.36 | 25.48 |
| | Edaslasie | KGS | 18.45 | 23.25 | 20.18 | 20.45 | 22.28 | 22.73 | 22.69 | 24.34 | 26.73 |
| | Hawzen | KGS | 23.46 | 23.20 | 22.50 | 23.77 | 23.89 | 22.23 | 21.17 | 24.10 | 26.60 |
| | Humera | KGS | - | - | - | 19.67 | - | - | - | - | - |
| | Maichew | KGS | 19.30 | 19.68 | 20.50 | 19.56 | 22.23 | 22.02 | 22.20 | 20.12 | 21.51 |
| | Mekelle | KGS | 22.25 | 24.45 | 24.82 | 26.95 | 28.03 | 28.37 | 28.06 | 29.14 | 30.86 |
| | Raya-azebo | KGS | - | - | - | - | - | 25.33 | 21.62 | 25.16 | 27.80 |
| | Sheraro | KGS | 15.86 | 17.80 | 17.26 | 18.80 | 19.40 | - | 20.80 | 21.72 | 22.08 |
| | Wukro | KGS | - | - | - | 24.50 | 23.60 | 25.19 | 25.95 | 27.83 | 28.30 |

Source: Tigray Agricultural Marketing promotion Agency (TAMPA), 2008